Revised Bridge to Bridge Phase 3 Design Modifications—2022

Restoration Design
Walla Wall River Bridge to Bridge Reach
Lowden, Washington

for
Tri-State Steelheaders

January 10, 2023

GeoEngineers

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Revised Bridge to Bridge Phase 3 Design Modifications—2022

Restoration Design
Walla Walla River Bridge to Bridge Reach
Lowden, Washington

File No. 11281-005-06

January 10, 2023

Prepared for:

Tri-State Steelheaders
216 North Roosevelt Street
Walla Walla, Washington 99362

Attention: Brian Burns and Morgan Morris

Prepared by:

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Table of Contents

1.0 INTRODUCTION AND BACKGROUND

GeoEngineers prepared the Walla Walla River Bridge to Bridge Design Drawings on July 15, 2016. Those design drawings included final designs for the Phase 2, Phase 3, and Phase 4 subreaches (Bridge to Bridge Reach) of the Walla Walla River. Since that time, the Bridge to Bridge reach has changed substantially, and several channel avulsions have occurred through the reach, particularly during the severe flooding in February 2020. The river enhancement project required redesign to account for the changes that occurred within the reach. GeoEngineers conducted a site reconnaissance with Tri-State Steelheaders in July of 2022 to identify updates to the previously proposed large woody material (LWM) structure locations and specific LWM selection. GeoEngineers prepared updated design drawings for the Phase 3 reach, dated December 2022 and included them in Appendix A. This report describes the changes between the July 2016 design and the updated Phase 3 reach design (2022).

1.1. Previous Design and Report

GeoEngineers prepared the original design drawings for the Bridge to Bridge reach dated July 15, 2016. We published a basis of design report for the restoration design of the Bridge to Bridge reach dated July 14, 2016 (GeoEngineers 2016). We described the engineering analysis and proposed design in the 2016 report. We defined the project goals and objectives in our 2010 Walla Walla River alternatives assessment and the Washington Recreation and Conservation Office (RCO) approved those goals and objectives for Project No. 08-2028 (GeoEngineers 2010). The RCO also approved the 2016 design drawings.

We prepared the updated Phase 3 reach design drawings following the project goals and objectives identified in our 2010 Walla Walla River alternatives assessment (GeoEngineers 2010).

As discussed in the 2010 alternatives assessment and the 2016 Revised Bridge to Bridge Basis of Design Report, the overarching project goals are to increase, enhance, and diversify aquatic, riparian and upland habitat and, specifically, to enhance instream and off-channel habitat for anadromous fish (GeoEngineers 2016, GeoEngineers 2010). To achieve the project goals, seven specific objectives were identified in the GeoEngineers 2010 report to develop design elements. These objectives included:

- Objective 1—Increase, Enhance, and Diversify Aquatic Habitat
- Objective 2—Increase, Enhance, and Diversify Riparian and Upland Habitat
- Objective 3—Increase Floodplain Connectivity
- Objective 4—Minimize Bank Erosion on Upper Terraces
- Objective 5—Geomorphic Stability
- Objective 6—Rapid Recovery Time
- Objective 7—Design Practicality

Due to channel response and avulsions, mentioned above, we considered the risk of channel migration caused by bank erosion to be lower than in the 2016 design. Therefore, we did not emphasize Objective 4 in this updated design of the Phase 3 subreach.

As a Washington State Salmon Recovery Funding Board (SRFB) funded project, we understand the design must be developed in accordance with the guidelines described in Appendix D of the Recreation Conservation Office (RCO) Manual 18 (Manual) (RCO 2023). The guidelines in the Manual require conceptual design plans to be developed and reviewed. For the purposes of this project, we assume the concepts developed in GeoEngineers' April 2010 River Enhancement Alternatives Assessment for the Walla Walla River, between McDonald Road and Lowden Road report satisfy the conceptual design submittal identified in the Manual 18 guidance (GeoEngineers 2010). Therefore, the final updated design drawings are included in Appendix A without additional submittal milestones.

2.0 DESIGN MODIFICATION SUMMARY

The following is a general description of design modifications between the updated Bridge to Bridge Phase 3 design drawings included with this report, dated January 10, 2023, and the design drawings dated July 15, 2016. These modifications retain the original design goals and objectives described above and respond to changing channel conditions. For specific design details, please see the updated Phase 3 design drawings in Appendix A.

2.1. Updated Exiting Conditions Data and Revised Project Extents

GeoEngineers conducted a site reconnaissance with Tri-State Steelheaders in July of 2022 to observe current channel conditions and to identify potential LWM structure types and locations based on current and anticipated channel conditions. These discussions and locations were recorded in Avenza maps and field notes and incorporated into the updated Phase 3 design (Avenza Systems 2022). Additionally, as requested by Tri-State Steelheaders, the Phase 3 subreach limits were modified. The new Phase 3 subreach extends approximately 1,250 feet upstream of the 2016 Phase 3 subreach to incorporate an area that was not enhanced during Phase 2 construction. The new Phase 3 subreach upstream limits end approximately 1,000 feet upstream of the 2016 Phase 3 project limits. The remaining downstream section of the Bridge to Bridge Reach will be included in future Phase 4 designs. An updated base map with 2022 survey and aerial imagery are included in the Phase 3 updated design drawings. We calculated the inundation boundary for the 1.5-year recurrence interval flow using previous hydraulic model conditions and the updated 2022 topographic and bathymetric survey. We assumed those inundation boundaries are representative of bankfull conditions for the current existing conditions.

2.2. Main Channel Enhancement Modifications

Removal of Terraces along Eroding Meanders: We removed the previously proposed terraces, meander jams, and flood fencing structures from the 2016 design due to the recent channel avulsions and changing channel conditions. As such, no grading is proposed in the 2022 Phase 3 design apart from a small amount of selective entrance grading to conduct enhancement of Side Channel A and Side Channel B (labeled Side Channel 5 in the 2016 plans), discussed below.

Modifications to LWM Structures: We discussed proposed locations of LWM structures with Tri-State Steelheaders during the 2022 site reconnaissance and updated the proposed locations based on changing channel conditions. We updated the proposed LWM structure designs based on wood stability analyses and our experience with recent projects in the area. General modifications include:

- Bank Rootwad LWM structures are proposed as a new structure type. These structures are similar to the Buried Snag and Rootwad LWM structures proposed in 2016, both in terms of design and function.
- An increased number of Flow Deflection Jam and Apex Jam LWM structures are proposed.
- Boulder ballasts and pinning are no longer proposed to secure structures. Rather, rope is proposed to secure LWM structures.
- To enhance structure stability, proposed piles are longer and are designed to deeper depths compared to the 2016 design.

For additional details on modifications to LWM structures, please see the updated Phase 3 design drawings (Appendix A).

2.3. Side Channel Enhancement Modifications

Fewer side channel enhancements are included in the revised design due to the recent channel avulsions and changing channel conditions. The revised Phase 3 design still includes enhancement at the entrances of 2016 Side Channel 5 (labeled Side Channel A and Side Channel B on Sheets 5.0 and 5.1). However, grading at the downstream limits of Side Channel 5 is no longer proposed. Additionally, regrading of the 2016 Side Channel 7 and Side Channel 8 are not included in this design update (note that these side channels were originally included in the Phase 2 project reach but are now located within the updated Phase 3 project reach). Additionally, Beaver Dam Analogs were removed from the proposed design at the request of Tri-State Steelheaders.

2.4. Additional Modifications

Proposed construction sequencing and dewatering were modified such that only one temporary diversion channel is required for construction, which utilizes existing side channels and would require fewer structures to be isolated individually using temporary isolation structures. No significant changes are proposed to riparian and upland planting. Throughout the reach, areas lacking mature vegetation and areas impacted by construction activities will be revegetated.

3.0 LIMITATIONS

We have prepared this report for the Tri-State Steelheaders and their authorized agents for the Walla Walla River Bridge to Bridge Phase 3 Design Modification project.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices in the field of stream and river habitat enhancement, stabilization and restoration design engineering in this area at the time this report was prepared. The conclusions, recommendations and opinions presented in this report are based on our professional knowledge, judgment and experience. No warranty, express or implied, applies to our services and this report.

Any electronic form, facsimile or hard copy of the original document (email, text, table and/or figure), if provided, and any attachments should be considered a copy of the original document. The original document is stored by GeoEngineers, Inc. and will serve as the official document of record.

4.0 REFERENCES

Avenza Systems. 2022. "Avenza Maps: Offline Mapping." Vol. Version 4.4.1. Avenza Systems Inc. https://www.avenza.com/avenza-maps/.

GeoEngineers. 2016. *Revised Basis of Design Report, Restoration Design Walla Walla River Bridge to Bridge Reach.* Spokane, Washington: GeoEngineers, Inc. .

GeoEngineers. 2010. *Walla Walla River Enhancement Alternatives Assessment between McDonald Road and Lowden Road.* Spokane, Washington: GeoEngineers, Inc. .

RCO. 2023. *Salmon Recover Grants. Manual 18 Salmon Recovery Grants.* Washington State Recreation and Conservation Office.

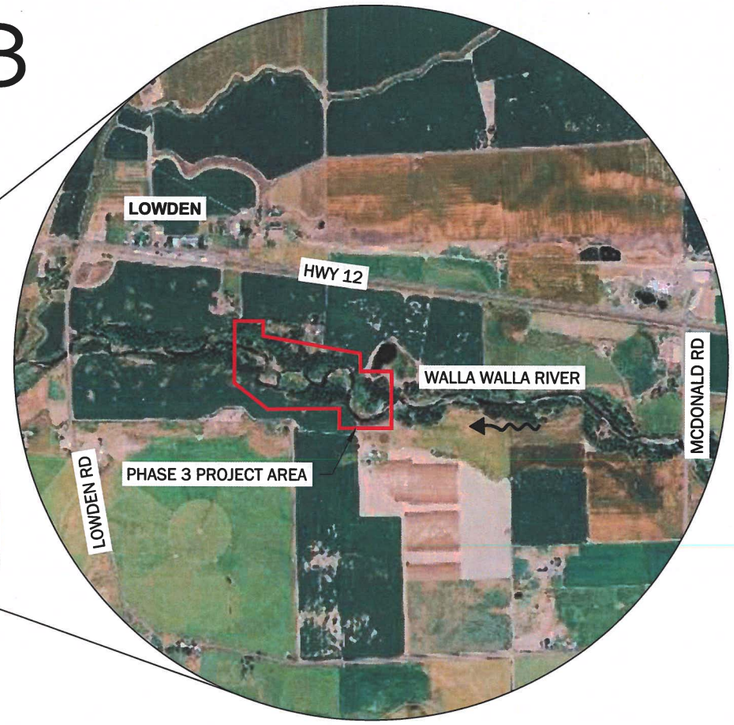
APPENDICES

GeoEngineers

APPENDIX A
Updated Phase 3 Design Drawings

Bridge to Bridge Phase 3

Walla Walla River Enhancement
DESIGN drawings



PROJECT LOCATION

THE PROJECT SITE IS LOCATED APPROXIMATELY 10 MILES WEST OF WALLA WALLA, WASHINGTON. TO GET TO THE EAST (UPSTREAM) END OF THE PROJECT SITE FROM WALLA WALLA HEAD WEST ON HIGHWAY 12 FOR APPROXIMATELY 10.7 MILES AND THEN TURN SOUTH ON MCDONALD ROAD. CONTINUE SOUTH ON MCDONALD ROAD FOR APPROXIMATELY 0.4 MILES UNTIL YOU CROSS THE WALLA WALLA RIVER. THE MCDONALD ROAD BRIDGE CROSSING THE WALLA WALLA RIVER IS THE EAST END OF THE PROJECT AND THE PROJECT CONTINUES DOWNSTREAM FOR APPROXIMATELY 2.0 MILES. MCDONALD ROAD IS APPROXIMATELY 1.5 MILES EAST OF THE TOWN OF LOWDEN, WASHINGTON.

CONTACT INFORMATION

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SHEET INDEX

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1/6/2023

Revision No:	Date:	Description:	Initials:	Designed: BHM, RSC
				Drawn: SCY & KHR
				Checked: RSC, JRS
				Date: 01/06/2023
				Project No: 11281-005-06

Walla Walla River
near Lowden, Washington

Tri-State Steelheaders

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Cover Sheet

Walla Walla River Bridge-to-Bridge Design Drawings

Sheet **1.0**

GENERAL NOTES:

1. These designs and drawings have been prepared for the exclusive use of the Tri-State Steelheaders (TSS) and their authorized agents. No other party may rely on the product of our services unless GeoEngineers Inc. (GeoEngineers) agrees in writing in advance of such use.
2. The drawings contained within should not be applied for any purpose or project except the Bridge-to-Bridge reach of the Walla Walla River (Project Reach) as shown in the Project Area located on Sheet 1.1.
3. These designs and drawings are copyrighted by GeoEngineers, Inc. Any use, alteration, deletion, or editing of this document without explicit written permission from GeoEngineers, Inc. is strictly prohibited. Any other unauthorized use of this document is prohibited.
4. TSS is advised to confirm that all necessary permits and approvals have been obtained prior to construction.
5. Geomorphic conditions can change and these designs are based on conditions that existed at the time the design was performed. The results of these designs may be affected by the passage of time, by manmade events such as construction on or adjacent to the site, or by natural events such as floods, earthquakes, slope instability or groundwater fluctuations. Always contact GeoEngineers before applying these designs to determine if they remain applicable.
6. All rivers, streams, rocks and woody habitat structures are potentially dangerous. These proposed improvements are intended to address a wide variety of constraints which target more naturally functioning stream systems and habitat. TSS and the property owner should address safety concerns appropriately.
7. Potential regulatory changes to flood elevations and flood extents resulting from the proposed enhancements have not been addressed by GeoEngineers as part of this project.
8. Channel erosion, channel migration and/or avulsions can be expected to occur over time. These channel processes are natural and appropriate for these stream systems.
9. Design specifics for structures shall be confirmed and/or verified by a qualified engineer prior to or during construction at each proposed structure location.
10. These figures were originally produced in color.

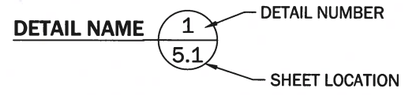
GENERAL CONSTRUCTION NOTES:

1. All contractors working within the project boundaries are responsible for compliance with all applicable safety laws. The contractor shall be responsible for all barricades, safety devices and control of traffic within and around the construction area.
2. All material and workmanship furnished on or for the project must meet the minimum requirements of project permits, approving agencies, specifications as set forth herein, or whichever is more restrictive.
3. Contractor shall not work within any wetland area until they have obtained a 404 permit from the United States Army Corps of Engineers. All work within or adjacent to any wetland area shall comply with the conditions of the 404 permit.
4. All federal, state and local permits shall be obtained by the Client prior to construction activity commencement.
5. The contractor shall install and maintain appropriate erosion and sediment control devices throughout the whole project site, including those associated with construction access, staging and stockpile areas throughout the project's construction period. Temporary construction and permanent erosion control measures shall be designed, constructed and maintained in accordance with all applicable local, state and federal regulations.
6. Construction activity shall be limited to the construction areas and access routes to minimize disturbance of the existing vegetation and landscape. All public and private property either inside or outside the construction limits impacted by construction shall be restored to a condition equal to or better than that which existed prior to the construction. No construction-related materials, debris, garbage, equipment, fuel, provisions of any kind shall remain on site after construction. No stockpiles or excavations are to remain after construction unless authorized by the landowner. The site will be graded to appear natural and conform to the natural topography.
7. Construction shall minimize disturbance to, and maximize reuse of, existing riparian vegetation to remain and salvage.
8. Only appropriate approved native riparian vegetation shall be used for cuttings and transplanting. Vegetation cutting, transplanting, planting and irrigation shall be managed by an appropriate professional.
9. Construction records and as-built information shall be accurately recorded by the contractor and supplied to the owner and GeoEngineers for future use, reference and monitoring. Submittal of record information is a condition of final acceptance.
10. This design has been performed and these plans have been prepared with the express understanding that GeoEngineers will provide guidance to the contractor during construction.
11. The long-term success of this project relies upon the success of the proposed vegetation. The vegetation and disturbed project site must be monitored and maintained to promote vigorous revegetation.
12. The project coordinate system is Washington State Plane South, US Feet.

ABBREVIATIONS:

WSEL	WATER SURFACE ELEVATION
TYP	TYPICAL
FT	FEET
ELEV	ELEVATION
Horiz.	HORIZONTAL
Vert.	VERTICAL
MIN	MINIMUM
MAX	MAXIMUM
NTS	NOT TO SCALE
AC	ACRES
BGS	BELOW GROUND SURFACE
ACW	ACTIVE CHANNEL WIDTH
OHW	ORDINARY HIGH WATER
SQ-FT	SQUARE FEET
CY	CUBIC YARDS
LS	LUMP SUM
EA	EACH
LF	LINEAR FEET

SECTION LOCATION CALLOUT



BID ITEM LIST

Item #	Item Description	Units	No. of Units
2100	Environmental Controls - Best Management Practices	LS	1
3110	Mobilization and Demobilization	LS	1
3120	Construction Staking	Day	2
3130	Temporary Channel Crossing	EA	2
3210	Clearing, Grubbing, Stockpile and Disposal	LS	1
3240, 3250	Temporary Stream Diversion, Dewatering	EA	9
3310	Side Chanel Excavation	CY	435
3510	Install Apex Jam	EA	10
3520	Install Flow Deflection jam	EA	12
3530	Install Bank Rootwads	EA	9
3540	Install Sweeper Logs	EA	4
3550	Install Main Channel Single Logs	EA	14
3560	Install Side Channel Single Logs	EA	6
3710	Seeding	AC	6.2
3720	Planting	EA	1217
3710	Site Cleanup and Repair	LS	1

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near Lowden, Washington

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General Notes And Quantities

Walla Walla River Bridge-to-Bridge
Design Drawings

Sheet
1.1

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Project Goals

The ultimate goal of this project is to increase, enhance and diversify aquatic, ripairan and upland habitat while increasing floodplain connectivity and minimizing excessive erosion of the terraces within a reasonable period of time by implementing geomorphically appropriate design techniques within the practical limits of the project constraints.

Project Objectives

Increase, Enhance and Diversify Aquatic Habitat
- Multiple Habitat Types Close Together
- Primary Pool Habitat
- Substrate Diversification
- Habitat Structure and Cover
- Side Channel/Off Channel Habitat
  - *Benefits Include:*
    - *Multiple Species and Life Stages*
    - *Spawning, Rearing, Holding, Refuge*

Increase, Enhance and Diversify Riparian and Upland Habitat
- Diverse Vegetation Consisting of Native Plants
  - *Benefits Include:*
    - *Overhead cover for Fish*
    - *Overall Habitat Complexity*
    - *Bird and Wildlife Habitat*
    - *LWD Recruitment*
    - *Bank Stability*
    - *Shade/Reduce Thermal Loading*

Minimize Bank Erosion Along Upper Terraces
- Maintain Main Channel Within Limits of Existing Terraces
  - *Benefits Include:*
    - *Maintains Existing Acreage and Land Use Along Upper Terraces*
    - *Reduces Fine Sediment Inputs*
    - *Geomorphically Appropriate Planform Alignment*
    - *Riparian Vegetation Establishment*
    - *Holding and Refugia Habitat for Fish*

Increase Floodplain Connectivity
- Excavate and/or Encourage More Flow Through Side Channels
- Layback Steep Slopes
  - *Benefits Include:*
    - *Reduced Flood Elevations and Velocities*
    - *Increased Flood Storage*
    - *Bed and Bank Stability*
    - *Overall Habitat Complexity*
    - *Hyporheic Exchange*
    - *Wetland Development*

Geomorphic Stability
- Self-Sustaining, Self-Maintaining
- Use of Natural Materials (Woody Habitat Structures, Rock Structures, Vegetation)
  - *Benefits Include:*
    - *Reduce Long-Term Maintenance*
    - *Bed and Bank Stability*
    - *Habitat Maturation*
    - *Reduce Risk of Severe Erosion and/or Incision*
    - *Improve Sediment Transport*

Rapid Recovery Time
- Channel, Vegetation and Habitat Establishment
- Limited Construction Seasons (Years)
- Not Dependent upon Long-Term Channel Migration

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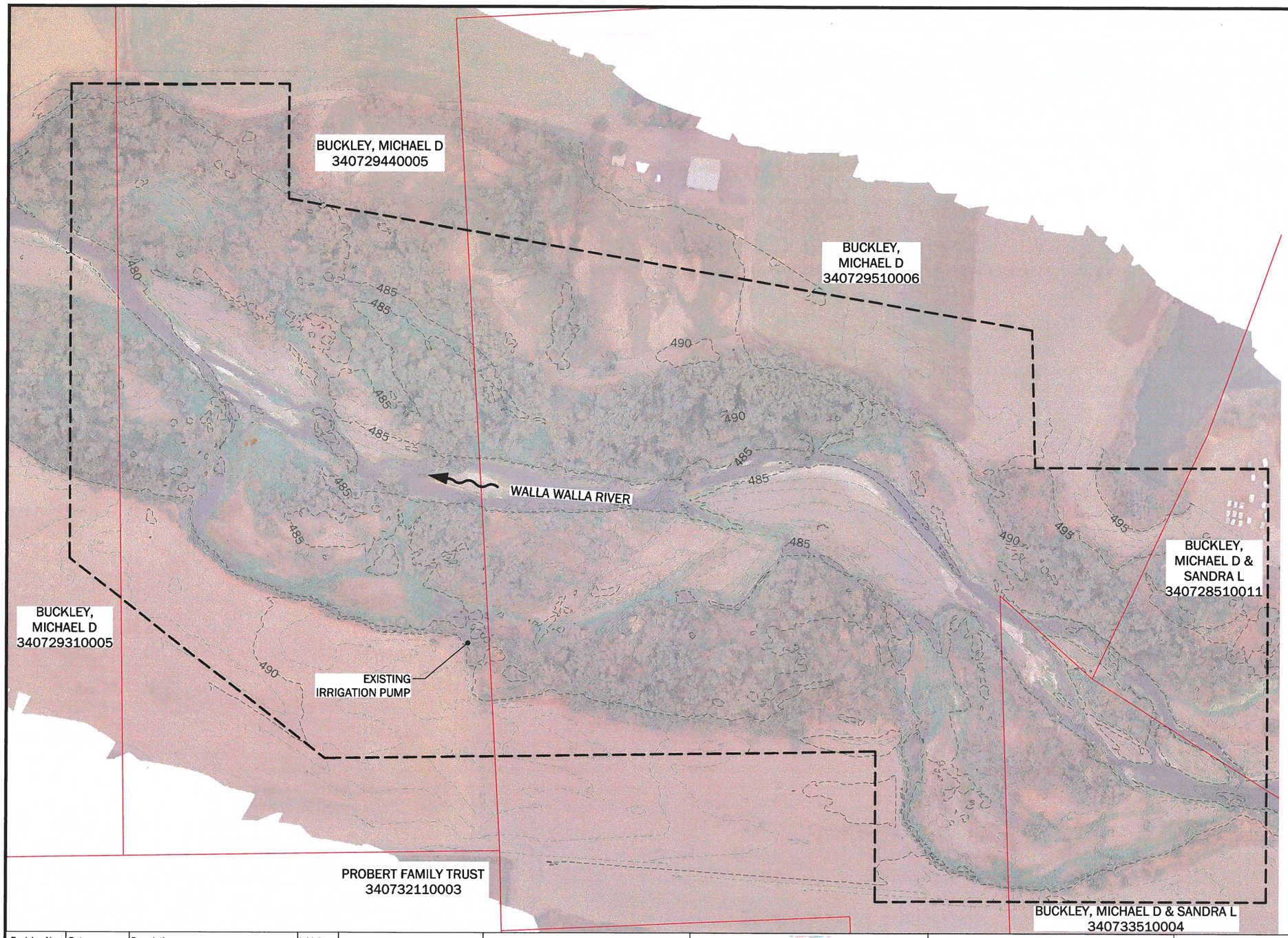
Project Goals And Objectives

Walla Walla River Bridge-to-Bridge Design Drawings

Sheet **1.2**



LEGEND:

- PHASE 3 BOUNDARY
- PARCEL PROPERTY BOUNDARY

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Existing Conditions Aerial And Topography

Walla Walla River Bridge-to-Bridge Design Drawings

Sheet
2.0

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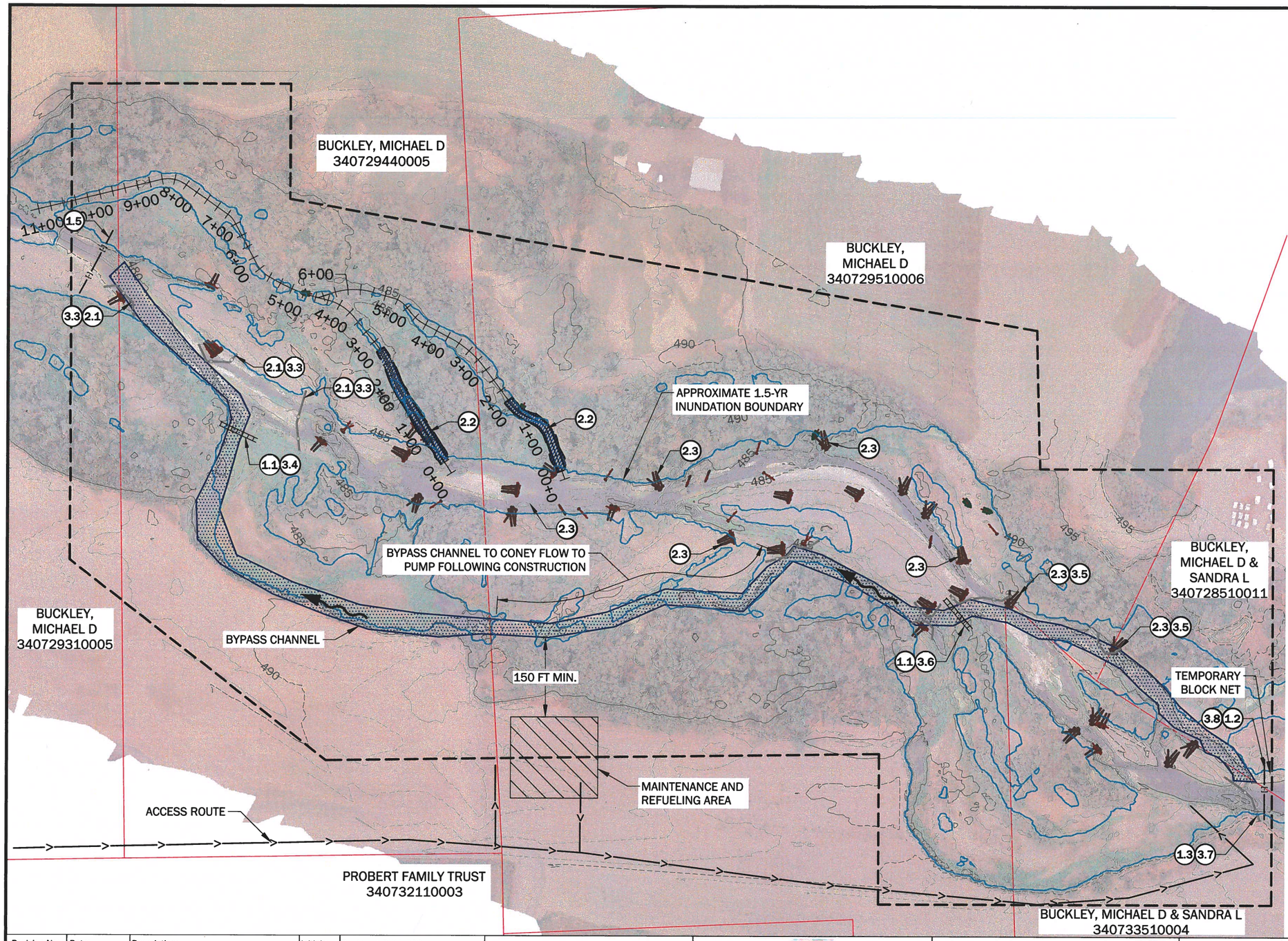

LEGEND:

- PHASE 3 BOUNDARY
- PARCEL PROPERTY BOUNDARY
- APPROXIMATE DISTURBANCE LIMITS
- (1.1) SEQUENCING
- BYPASS CHANNEL
- SIDE CHANNEL ENHANCEMENT
- MAINTENANCE AND REFUELING AREA
- ACCESS ROUTE
- TEMPORARY BLOCK NET
- 1.5 YEAR INUNDATION BOUNDARY
- SIDE CHANNEL ALIGNMENT
- LARGE WOOD
- TEMPORARY ISOLATION STRUCTURE

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Phase 3 Construction Sequencing And Dewatering

Walla Walla River Bridge-to-Bridge Design Drawings

Sheet **3.0**

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PHASE 3 CONSTRUCTION SEQUENCING AND FISH MANAGEMENT PLAN

Work in the river below the Ordinary High Water Mark (OHWM) shall only occur during the allowable in-water work window, or as otherwise specified in project-specific environmental permits. Work above and beyond the OHWM may occur any time of the year as weather, site conditions and permits allow.

Construction shall occur in the following general steps, which correspond numerically to those shown on Sheet 3.0. Not all numbers are represented on Sheet 3.1.

GENERAL SITE PREPARATION

1. Install and maintain necessary erosion and sedimentation controls, including a construction site entrance and all BMPs identified in the State of Washington Construction Stormwater General Permit prepared by the Contractor.
2. Remove unnecessary/undesirable underbrush in areas to be disturbed.
3. Establish survey control.
4. Establish limits of excavation/fill, stockpile areas, staging areas, haul roads and signage.
5. Mark all trees to remain. Provide protective barriers meeting requirements of the project specifications for tree and plant protection and salvage.

1. DIVERT RIVER TO BYPASS CHANNEL

1.1. Install temporary vehicular channel crossings.

1.2. Install block nets at the upstream limits of the main channel diversion.

1.3. Seine and/or shock fish from the project reach.

1.4. Install the first phase of channel diversion structures to route flow into temporary bypass channel.

1.5. Install block nets at the downstream site disturbance limits.

2. CONSTRUCT LARGE WOODY MATERIAL STRUCTURES

2.1. Install work zone isolation structures for large woody material placement impacted by temporary bypass channel and main channel.

2.2. Excavate and grade side channels as shown on Sheets 5.0 and 5.1.

2.3. Install large wood material structures as indicated on the construction drawings.

3. RESTORE SITE AND DEMOBILIZE

3.1. Revegetate excavated areas and constructed large woody structure areas sequentially from downstream to upstream.

3.2. Regrade and revegetate areas disturbed due to vehicular traffic within the floodplain from downstream to upstream.

3.3. Remove temporary work zone isolation structures starting downstream and progressing upstream.

3.4. Remove downstream temporary bypass channel crossing.

3.5. Remove upstream work zone isolation structure on north bank, and continue structure removal downstream of the upstream temporary stream crossing.

3.6. Remove upstream temporary bypass channel vehicular crossing. Contractor to maintain the temporary bypass channel as indicated on sheet 3.0 to allow channel flow to the existing irrigation pump.

3.7. Remove upstream work zone isolation structure and rewater the existing channel north of the temporary bypass channel.

3.8. Remove block nets from upstream and downstream of the diversion. Remove diversion structure.

4. REPAIR STOCKPILE, STAGING AND ACCESS AREAS

5. REMOVE TEMPORARY EROSION CONTROL MEASURES

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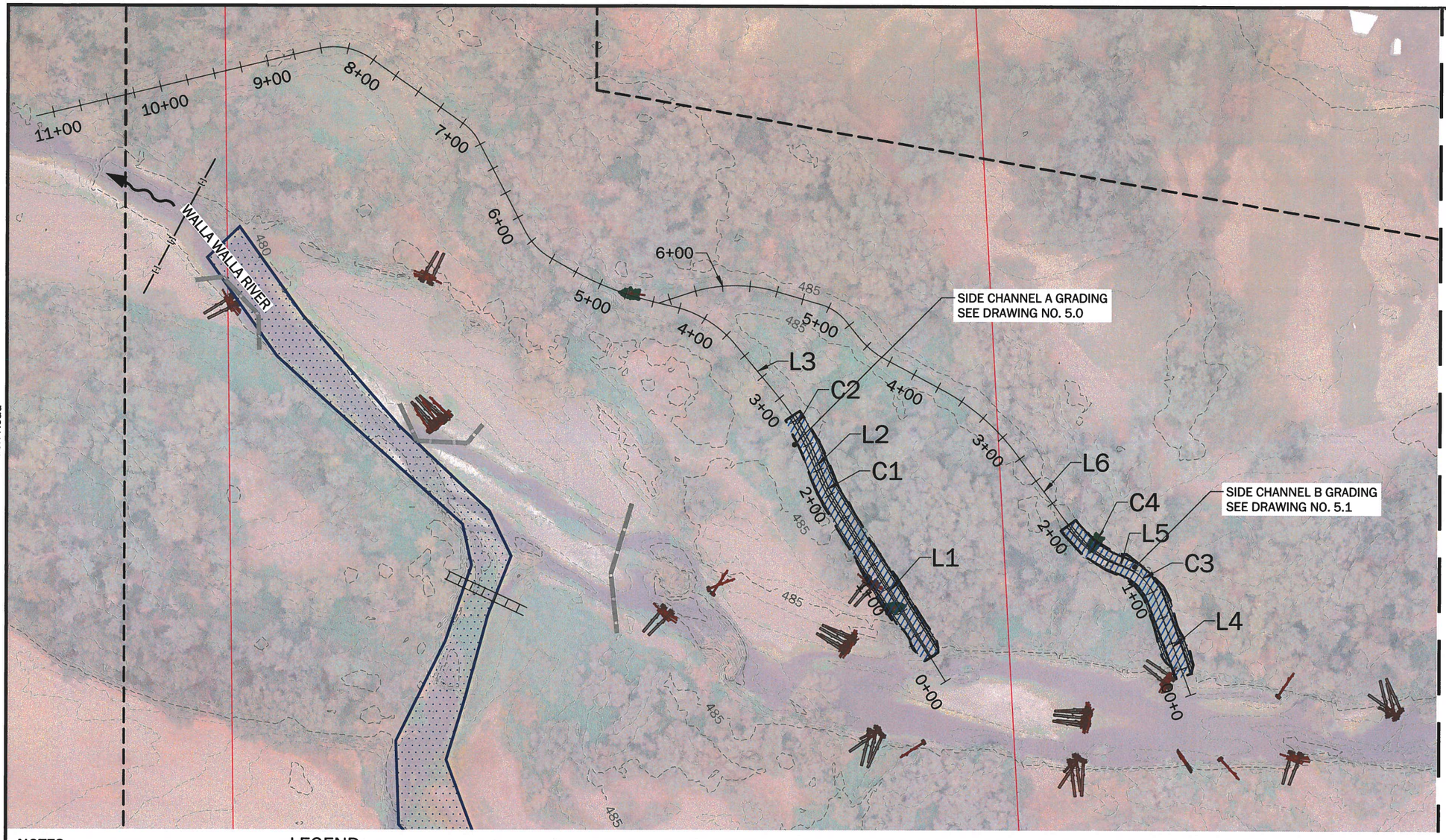
Phase 3 Construction Sequencing And Dewatering Notes

Walla Walla River Bridge-to-Bridge Design Drawings

Sheet **3.1**



NOTES:

1. SEE DRAWING 5.0 AND 5.1 FOR SIDE CHANNEL GRADING.
2. SEE DRAWINGS 6.0 TO 6.5 FOR LWM CONTROL POINTS AND DETAILS.
3. SINGLE LOGS TO BE FIELD FIT.

LEGEND:

- PHASE 3 BOUNDARY
- PARCEL PROPERTY BOUNDARY
- 485 EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- SIDE CHANNEL GRADING
- LWM STURCTURE
- FLOW DEFLECTION JAM
- SWEEPER LOGS
- BANK ROOTWADS
- SINGLE LOGS

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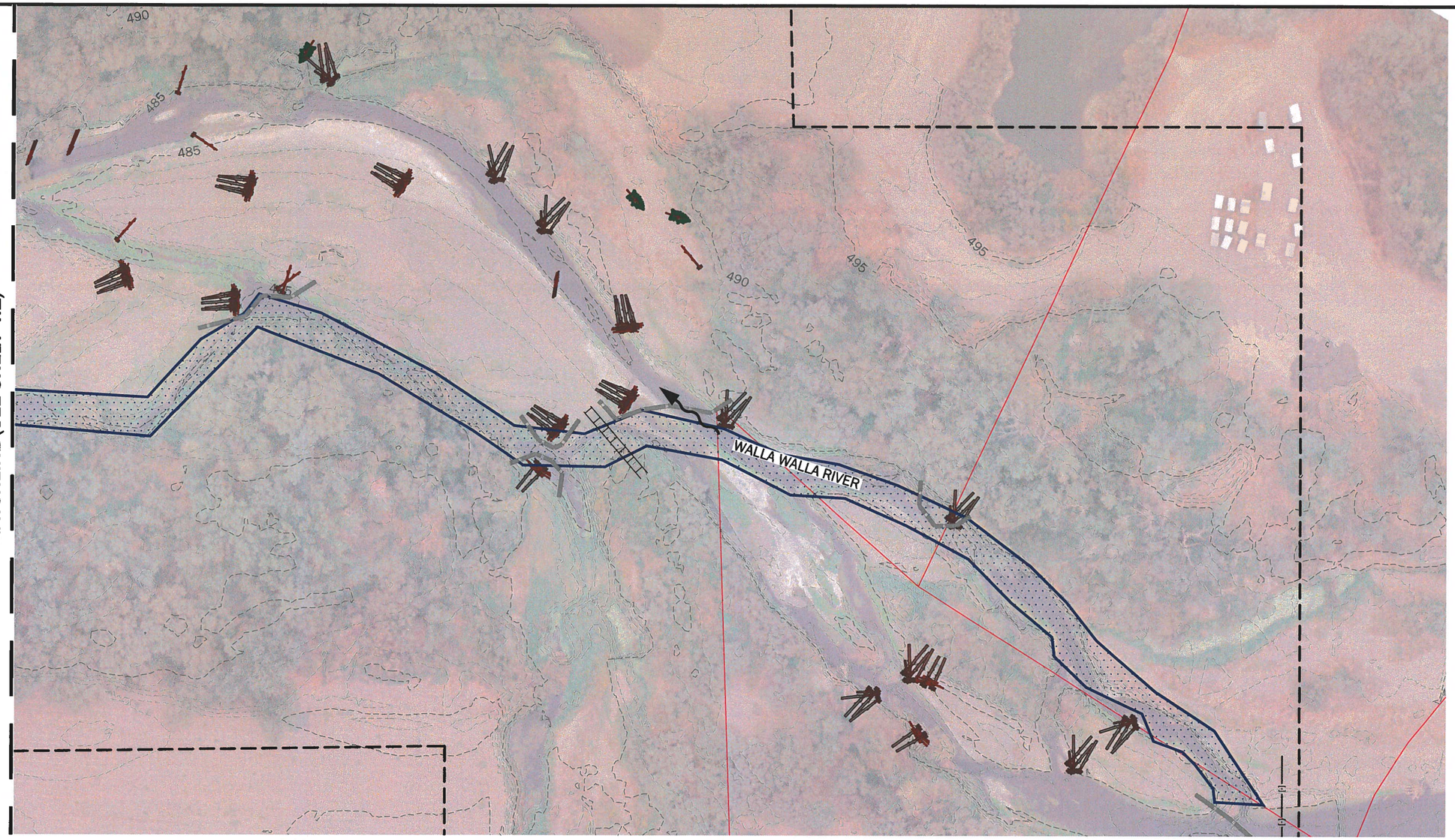
Proposed Conditions Overview

Walla Walla River Bridge-to-Bridge
Design Drawings

Sheet
4.0



NOTES:

1. SEE DRAWINGS 6.0 TO 6.5 FOR LWM CONTROL POINTS AND DETAILS.
2. SINGLE LOGS TO BE FIELD FIT.

LEGEND:

- PHASE 3 BOUNDARY
- PARCEL PROPERTY BOUNDARY
- 485 EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- SIDE CHANNEL GRADING
- LWM STURCTURE
- FLOW DEFLECTION JAM
- SWEEPER LOGS
- BANK ROOTWADS
- SINGLE LOGS

N W E S

100 0 100
Feet

RYAN S. CARNIE
STATE OF WASHINGTON
52457
REGISTERED
PROFESSIONAL ENGINEER
1/10/2023

Revision No:	Date:	Description:	Initials:	Designed: BHM, RSC
				Drawn: SCY & KHR
				Checked: RSC, JRS
				Date: 01/06/2023
				Project No: 11281-005-06

Walla Walla River
near Lowden, Washington

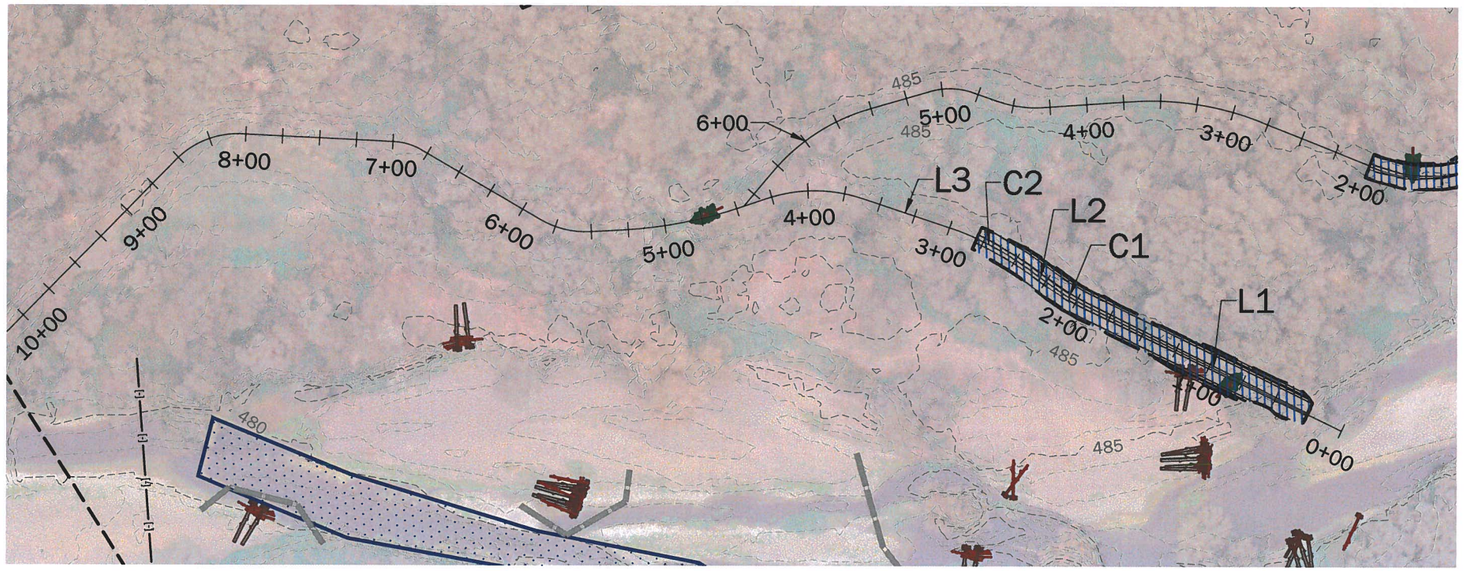
Tri-State Steelheaders

GeoEngineers
412 East Parkcenter Blvd., Suite 305
Boise, Idaho 83706

Proposed Conditions Overview

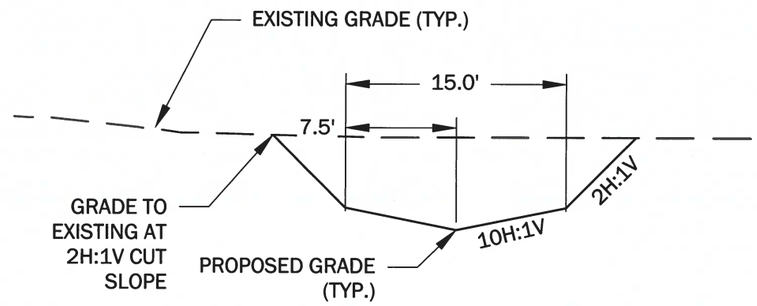
Walla Walla River Bridge-to-Bridge
Design Drawings

Sheet
4.1



PLAN

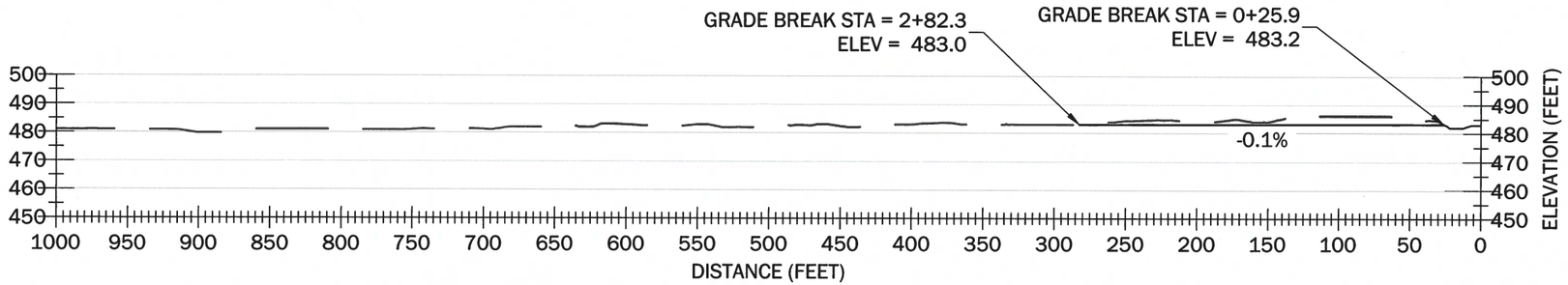
100 0 100
Feet



TYPICAL SECTION

10 0 10
Feet

VERTICAL EXAGGERATION = 2X
VERTICAL SCALE 1" = 5'



PROFILE

100 0 100
Feet

VERTICAL EXAGGERATION = 2X
VERTICAL SCALE 1" = 50'

NOTES:

- ENTRANCES TO SIDE CHANNELS ARE TO BE REGRADED UP AS SHOWN.
- SIDE CHANNEL THALWEG IS APPROXIMATE AND TO BE FIELD IDENTIFIED.
- CROSS SECTION CENTERLINE STATION IS LOCATED ALONG THE THALWEG ALIGNMENT.
- Y-AXIS IS ELEVATION (FEET), X AXIS IS DISTANCE ALONG A CHORD PERPENDICULAR TO THE EXISTING THALWEG. THE ZERO STATION SHOWN ON THESE CROSS SECTIONS REPRESENTS THE EXISTING THALWEG ALIGHNMENT.
- SIDE CHANNEL GRADING DOWNSTREAM OF INLET SECTION IS SHOWN AS APPROXIMATE. THE EXTENT OF GRADING WILL BE FIELD VERIFIED.

SIDE CHANNEL A HORIZONTAL CONTROL

NUMBER	START STATION	START NORTHING (FT)	START EASTING (FT)	LINE/CHORD DIRECTION	CURVE RADIUS	LENGTH	END STATION
L1	0+00	267752.8	2128214.4	N32° 00' 11.14"W		194.0	1+94
C1	1+94	267917.3	2128111.6	N27° 13' 18.79"W	142	23.6	2+18
L2	2+18	267938.3	2128100.8	N22° 26' 26.44"W		23.5	2+41
C2	2+41	267960.0	2128091.9	N30° 59' 33.09"W	200	59.7	3+01
L3	3+01	268011.0	2128061.2	N39° 32' 39.74"W		61.9	3+63

Revision No:	Date:	Description:	Initials:

Designed: BHM, RSC
Drawn: SCY & KHR
Checked: RSC, JRS
Date: 01/06/2023
Project No: 11281-005-06

Walla Walla River
near Lowden, Washington

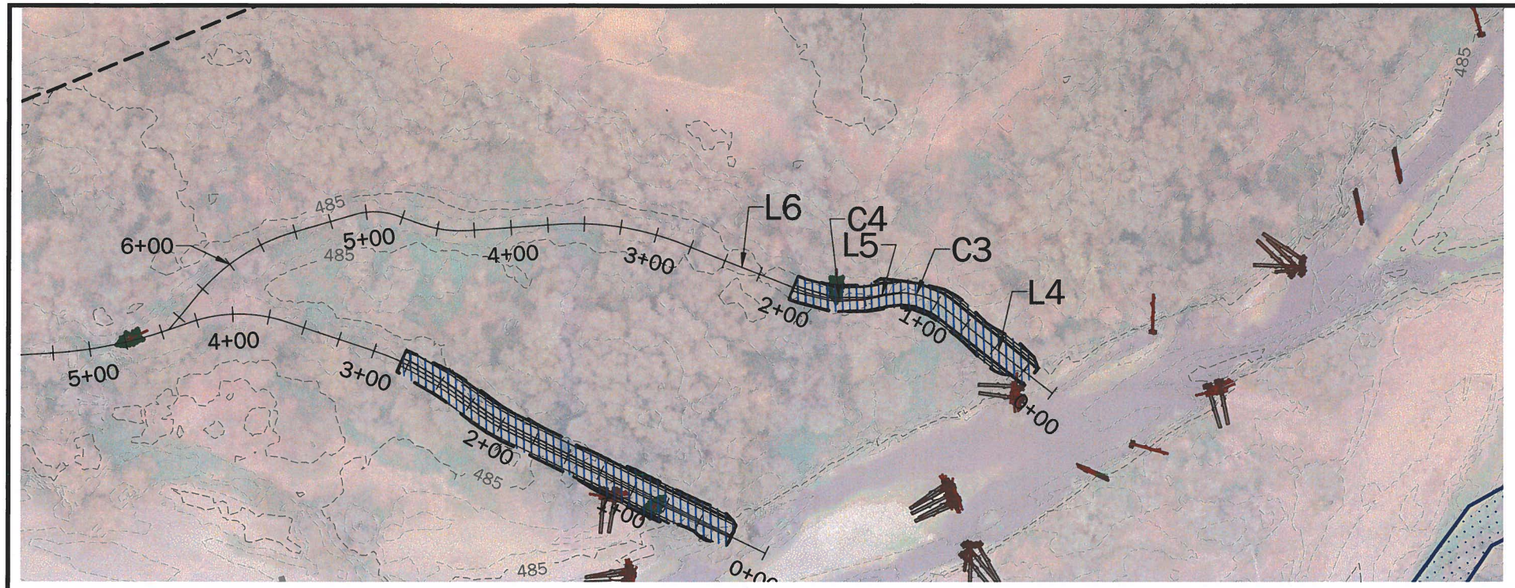
Tri-State Steelheaders

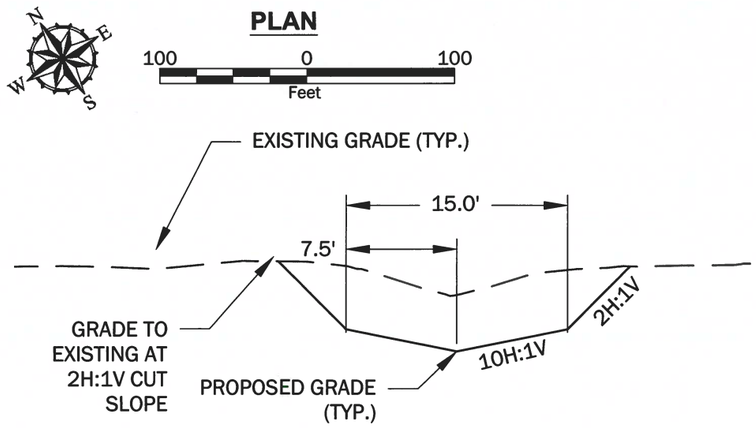
GeoEngineers
412 East Parkcenter Blvd., Suite 305
Boise, Idaho 83706

Proposed Side Channel A Plan And Profile

Walla Walla River Bridge-to-Bridge Design Drawings

Sheet
5.0

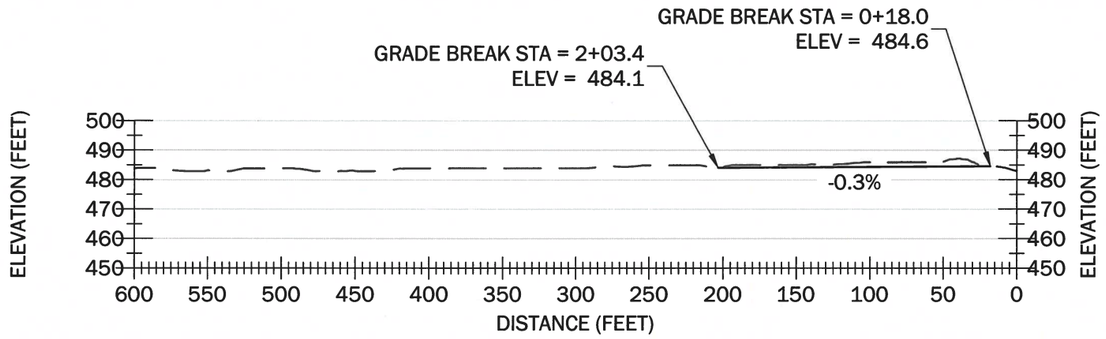




TYPICAL SECTION

10 0 10
Feet

VERTICAL EXAGGERATION = 2X
VERTICAL SCALE 1" = 5'



PROFILE

100 0 100
Feet

VERTICAL EXAGGERATION = 2X
VERTICAL SCALE 1" = 50'

NOTES:

- ENTRANCES TO SIDE CHANNELS ARE TO BE REGRADED SHOWN.
- SIDE CHANNEL THALWEG IS APPROXIMATE AND TO BE FIELD IDENTIFIED.
- CROSS SECTION CENTERLINE STATION IS LOCATED ALONG THE THALWEG ALIGNMENT.
- Y-AXIS IS ELEVATION (FEET), X AXIS IS DISTANCE ALONG A CHORD PERPENDICULAR TO THE EXISTING THALWEG. THE ZERO STATION SHOWN ON THESE CROSS SECTIONS REPRESENTS THE EXISTING THALWEG ALIGHNMENT.
- SIDE CHANNEL GRADING DOWNSTREAM OF INLET SECTION IS SHOWN AS APPROXIMATE. THE EXTENT OF GRADING WILL BE FIELD VERIFIED.

SIDE CHANNEL B HORIZONTAL CONTROL

NUMBER	START STATION	START NORTHING (FT)	START EASTING (FT)	LINE/CHORD DIRECTION	CURVE RADIUS	LENGTH	END STATION
L4	0+00	267741.0	2128437.6	N19° 55' 07.77"W		93.4	0+93
C3	0+93	267828.8	2128405.8	N45° 27' 16.36"W	49	43.3	1+37
L5	1+37	267858.2	2128375.9	N70° 59' 24.95"W		3.6	1+40
C4	1+40	267859.4	2128372.6	N53° 39' 48.52"W	91	55.3	1+96
L6	1+96	267891.6	2128328.7	N36° 20' 12.09"W		84.5	2+80

Revision No:	Date:	Description:	Initials:	Designed: BHM, RSC
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				Date: 01/06/2023
				Project No: 11281-005-06

Walla Walla River
near Lowden, Washington

Tri-State Steelheaders

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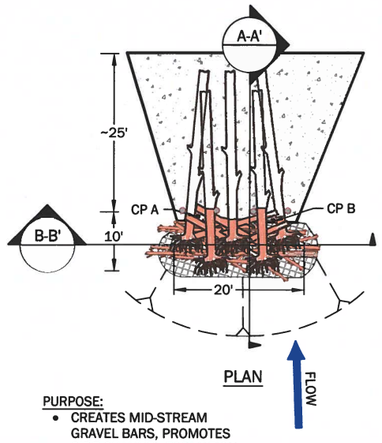
412 East Parkcenter Blvd., Suite 305
Boise, Idaho 83706

Proposed Side Channel B Plan And Profile

Walla Walla River Bridge-to-Bridge Design Drawings

Sheet
5.1

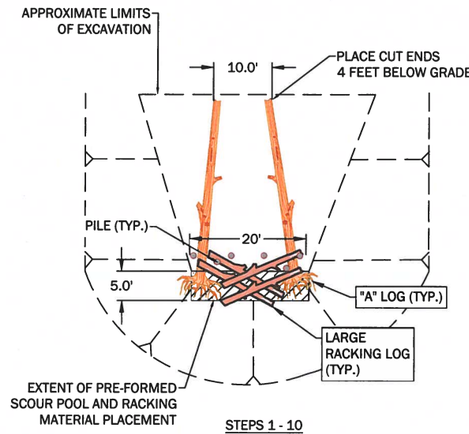


PURPOSE:

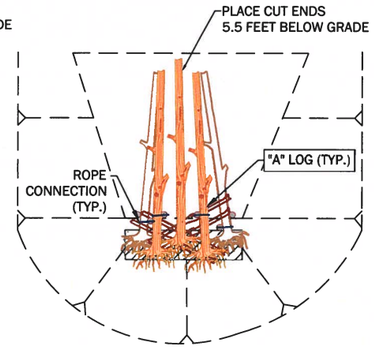
- CREATES MID-STREAM GRAVEL BARS, PROMOTES SIDE CHANNEL FORMATION AND MAINTAINS SIDE CHANNEL INLETS.
- CREATES DIVERSE HABITAT AND GRAVEL CONDITIONS.

DESIGN SPECIFICS:

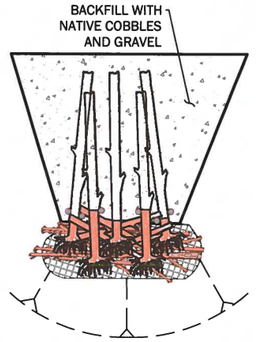
- THE DESIGN ENGINEER SHALL MAINTAIN THE ABILITY TO MAKE ADJUSTMENTS TO THE PROPOSED STRUCTURE IF SITE CONDITIONS WARRANT.
- SEE TABLE FOR MATERIAL SIZES AND QUANTITIES
- SEE THIS SHEET FOR CONTROL POINT TABLE.



STEPS 1 - 10



STEPS 11 - 12



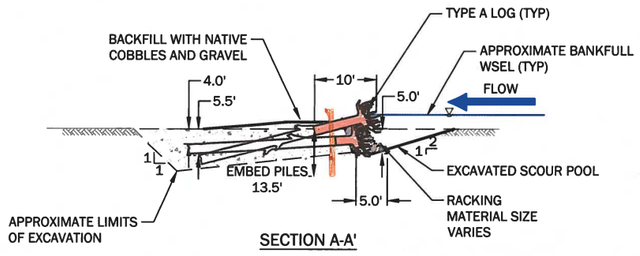
STEP 13 - 14

CONSTRUCTION SEQUENCING:

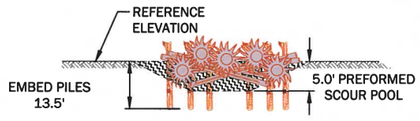
1. INSTALL WORK ISOLATION STRUCTURES AND DEWATER THE WORK AREA.
2. ESTABLISH REFERENCE ELEVATION PRIOR TO CONSTRUCTION AND CONFIRM WITH HYDRAULIC ENGINEER. REFERENCE GRADE HUB SHOULD BE ESTABLISHED OUTSIDE OF DISTURBANCE LIMITS AND USED TO CHECK STRUCTURE EMBEDDED DEPTHS. REFERENCE GRADE IS TYPICALLY THE AVERAGE GRADE OF THE ADJACENT GRAVEL BAR.
3. EMBED 6 PILES 13.5 FEET BELOW REFERENCE ELEVATION PER PILE DETAIL ON DRAWING 6.5.
4. EXCAVATE 20.0 FOOT BY 5.0 FOOT PRE-FORMED SCOUR POOL, 5.0 FEET BELOW REFERENCE ELEVATION.
5. EXCAVATE A TRENCH TO PLACE TYPE A LOGS. TRENCH DEPTH VARIES BETWEEN 4.0 TO 6.0 FEET BELOW REFERENCE ELEVATION.
6. PLACE 2 TYPE A LOGS WITH THE ROOTWAD END IN THE SCOUR POOL. TOP OF THE LOG IN THE SCOUR POOL SHALL BE 1-FOOT BELOW REFERENCE ELEVATION. ANGLE THE LOG BOLE INTO THE TRENCH SO THAT THE CUT END IS 4 FEET BELOW FINISHED GRADE.
7. SECURE EACH TYPE A LOG TO AN ADJACENT PILE PER ROPE CONNECTION DETAIL ON DRAWING 6.5.
8. PLACE SLASH MATERIAL BETWEEN THE TWO TYPE A LOGS.
9. PLACE 4 LARGE RACKING LOGS. CROSS LOGS BETWEEN THE TYPE A LOGS AND EXTEND THE LOGS INTO THE PREFORMED SCOUR POOL.
10. WEAVE 12 SMALL RACKING LOGS BETWEEN TYPE A LOGS.
11. PLACE 3 TYPE A LOGS AS SHOWN IN PLAN VIEW WITH ROOTWADS IN SCOUR POOL UPSTREAM AND ON TOP OF THE PREVIOUSLY PLACED TYPE A LOGS AND TYPE C LOGS. PLACE THE CENTER LOG 0.5 FEET BELOW REFERENCE ELEVATION (MEASURE TO TOP OF LOG) AND PLACE THE REMAINING TWO TYPE A LOGS 1.8 FEET ABOVE FINISHED GRADE.PLACE SMALL RACKING MEMBERS OR SLASH TO ACHIEVE DESIRED ELEVATIONS. ANGLE THE THREE TYPE A LOGS INTO THE TRENCH SO THAT THE CUT END IS 5.5 FEET BELOW REFERENCE ELEVATION.
12. SECURE THE OUTER TYPE A LOGS TO AN ADJACENT PILE PER ROPE CONNECTION DETAIL ON DRAWING 6.5.
13. BACKFILL THE STRUCTURE WITH EXCAVATED NATIVE COBBLES AND GRAVEL. PLACE BACKFILL IN 1.0 FOOT LIFTS AND COMPACT WITH EXCAVATOR BUCKET OR SIMILAR METHOD BETWEEN LIFTS. RETAIN A 2:1 (HORIZONTAL TO VERTICAL) SLOPE INTO THE PRE-FORMED SCOUR POOL.
14. REMOVE DEWATERING AND FLOW ISOLATION STRUCTURE.

STRUCTURE QUANTITIES					
LOG TYPE A - LARGE ROOTWAD	LARGE RACKING LOG	SMALL RACKING LOGS	PILE	SLASH MATERIAL (CY)	ROPE CONNECTIONS (EACH)
25-35' LOG WITH ROOTWAD 16" TO 21" DBH	12-16' LOG 9" TO 14" AVG. DIA.	6' TO 6'-15' TO 8" AVG. DIA.	18' LONG MIN., 15" AVG. DIA.		
5	4	12	6	10	5

CONTROL POINT TABLE		
CONTROL POINT	NORTHING	EASTING
A1a	267987.3	2127743.7
A1b	267995.0	2127752.8
A2a	267783.4	2128119.1
A2b	267793.5	2128125.5
A3a	267714.2	2128338.0
A3b	267726.1	2128339.8
A4a	267620.3	2128764.5
A4b	267631.6	2128760.7
A5a	267702.8	2128872.5
A5b	267714.4	2128875.4
A6a	267598.5	2128861.0
A6b	267610.5	2128860.7
A7a	267707.8	2129010.0
A7b	267717.9	2129016.5
A8a	267487.7	2129151.1
A8b	267496.9	2129158.7
A9a	267584.3	2129213.7
A9b	267585.8	2129225.5
A10a	267512.0	2129214.7
A10b	267522.1	2129221.2



SECTION A-A'



SECTION B-B'

APEX JAM 6
NTS ###

Revision No:	Date:	Description:	Initials:	Designed: BHM, RSC
				Drawn: SCY & KHR
				Checked: RSC, JRS
				Date: 01/06/2023
				Project No: 11281-005-06

Walla Walla River near Lowden, Washington

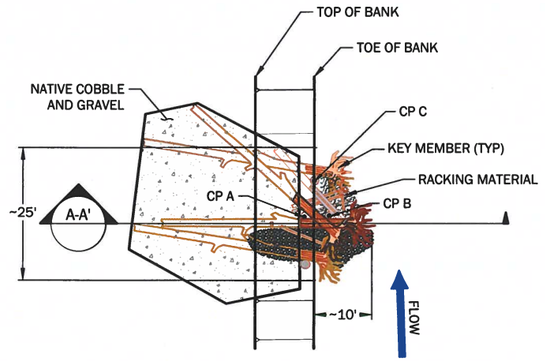
Tri-State Steelheaders

GeoEngineers
412 East Parkcenter Blvd., Suite 305
Boise, Idaho 83706

Typical Details - Apex Jam

Walla Walla River Bridge-to-Bridge Design Drawings

Sheet 6.0



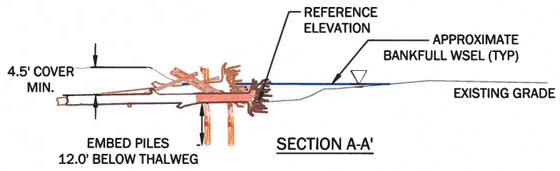
PLAN

PURPOSE:

- PROVIDES INCREASED HYDRAULIC ROUGHNESS THROUGHOUT THE REACH.
- REDIRECTS FLOWS TO OPPOSITE BANK.
- OVER TIME ACCUMULATES ADDITIONAL LARGE WOOD MATERIAL.

DESIGN SPECIFICS:

- THE DESIGN ENGINEER SHALL MAINTAIN THE ABILITY TO MAKE ADJUSTMENTS TO THE PROPOSED STRUCTURE IF SITE CONDITIONS WARRANT.
- SEE TABLE FOR MATERIAL SIZES AND QUANTITIES.
- SEE DRAWING NO. 6.6 FOR CONTROL POINT TABLE.

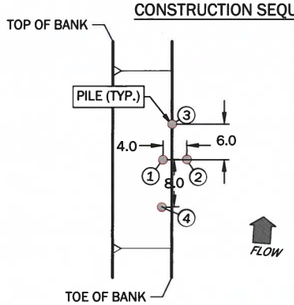


SECTION A-A'

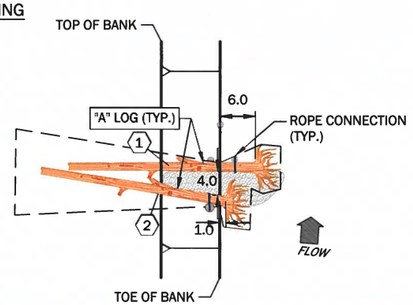
STRUCTURE QUANTITIES						
LOG TYPE A - LARGE ROOTWAD	LOG TYPE F - 30-FOOT TREE TOP	PILE	LARGE RACKING LOGS	SMALL RACKING LOGS	SLASH MATERIAL (CY)	ROPE CONNECTIONS (EACH)
30' MIN. LONG LOG WITH ROOTWAD 16" TO 21" DBH	25-35' LONG LOG 10" TO 16" AVG. DIA.	18' MIN. LONG, 15" AVG. DIA.	12-16' LONG, 9" TO 14" AVG. DIA.	6' TO 15' LONG, 6" TO 8" AVG. DIA		
4	1	4	6	6	4	5

FLOW DEFLECTION JAM 8
NTS ###

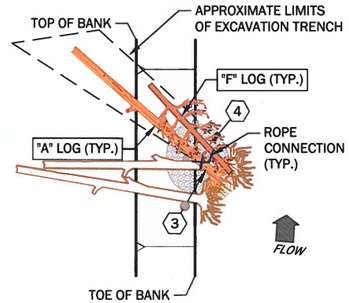
CONSTRUCTION SEQUENCING



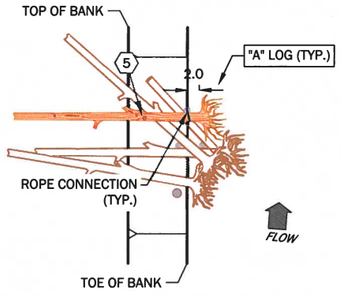
1. INSTALL WORK ISOLATION STRUCTURES AND DEWATER THE WORK AREA.
2. ESTABLISH REFERENCE ELEVATION PRIOR TO CONSTRUCTION AND CONFIRM WITH HYDRAULIC ENGINEER. REFERENCE GRADE HUB SHOULD BE ESTABLISHED OUTSIDE OF DISTURBANCE LIMITS AND USED TO CHECK STRUCTURE EMBEDDED DEPTHS. REFERENCE GRADE IS THE THALWEG ELEVATION ADJACENT TO THE STRUCTURE.
3. EMBED PILES 12 FEET BELOW REFERENCE ELEVATION PER PILE DETAIL ON DRAWING 6.5.



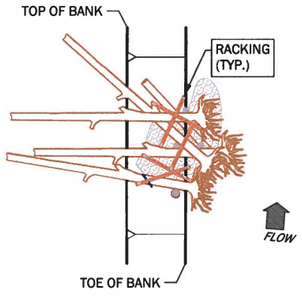
4. EXCAVATE A TRENCH FOR LOGS 1 AND 2. TRENCH DEPTH SHALL BE DEEP ENOUGH TO ALLOW 4.5 FEET OF COVER OVER LOGS.
5. PLACE LOG 1 (TYPE A) PERPENDICULAR (0°) TO THE TOE OF THE BANK. THE LOG BOLE EXTENDS 6 FEET PAST THE TOE OF THE BANK (MEASUREMENT DOES NOT INCLUDE ROOTWAD). ROOTWAD SHALL BE PARTIALLY EMBEDDED INTO THE CHANNEL.
6. PLACE LOG 2 (TYPE A) WITH ROOTWAD ORIENTED AT SLIGHT ANGLE UPSTREAM (5 TO 10°). THE LOG BOLE EXTENDS 1 FEET PAST THE TOE OF THE BANK (MEASUREMENT DOES NOT INCLUDE ROOTWAD).
7. SECURE LOG 1 TO PILE 2 PER ROPE CONNECTION DETAIL ON DRAWING 6.5.
8. PLACE SLASH BETWEEN LOGS 1 AND 2.



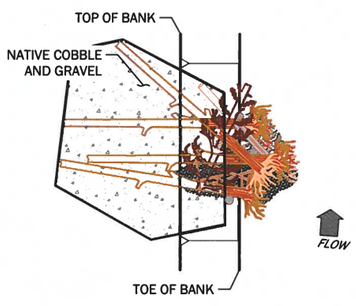
9. EXCAVATE A TRENCH FOR LOGS 3 (TYPE A) AND 4 (TYPE F). TRENCH SHALL BE DEEP ENOUGH TO ALLOW 4.5 FEET OF COVER OVER LOGS.
10. PLACE LOG 3 ON TOP OF LOG 1 AND BETWEEN PILES 1 AND 2. CUT END OF LOG 3 SHALL BE 4.5 FEET BELOW THALWEG ELEVATION. USE ROPE TO CONNECT LOG 3 TO LOG 1.
11. PLACE LOG 4 ON TOP OF LOG 1 AND BETWEEN PILES 2 AND 3. EMBEDDED END OF LOG 4 SHALL BE 3 FEET BELOW THALWEG ELEVATION. USE ROPE TO CONNECT LOG 4 TO PILE 2.
12. PLACE SMALL RACKING MEMBERS AND SLASH BETWEEN LOGS 1, 2, 3, AND 4.



13. PLACE LOG 5 (TYPE A) DOWNSTREAM OF PILE 3 AND PERPENDICULAR TO THE TOE OF THE BANK. THE LOG BOLE EXTENDS 2.0 FEET PAST THE TOE OF THE BANK (MEASUREMENT DOES NOT INCLUDED ROOTWAD). EXCAVATE AS NEEDED TO EMBED THE CUT END OF LOG 5 INTO THE BANK. THE BOTTOM OF THE LOG AT BOTH THE CUT AND THE ROOTWAD SIDE SHALL BE 0.5 FEET ABOVE THE THALWEG WITH THE ROOTWAD PARTIALLY EMBEDDED INTO THE CHANNEL BED.
14. SECURE LOG 5 TO PILE 1 PER ROPE CONNECTION DETAIL.



15. WEAVE THE REMAINING RACKING MATERIAL AND SLASH BETWEEN THE ROOTWADS AND PILES.



16. BACKFILL THE STRUCTURE AND REBUILD THE BANK WITH NATIVE COBBLES AND GRAVEL. PLACE BACKFILL IN 1.0 FOOT LIFTS AND COMPACT WITH EXCAVATOR BUCKET OR SIMILAR METHOD BETWEEN LIFTS.
17. REMOVE DEWATERING AND FLOW ISOLATION STRUCTURE.

Revision No:	Date:	Description:	Initials:	Designed: BHM, RSC
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Walla Walla River near Lowden, Washington

Tri-State Steelheaders

GeoEngineers
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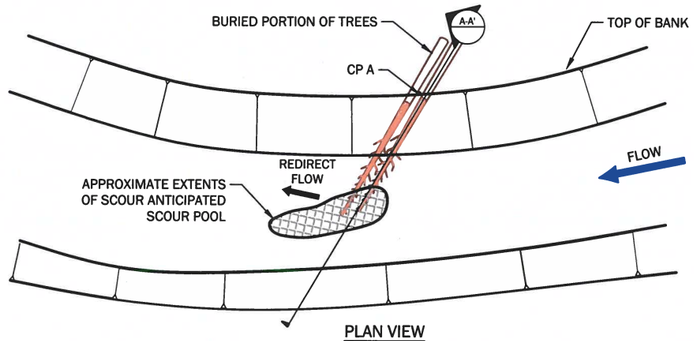
Boise, Idaho 83706

Typical Details - Flow Deflection Jam

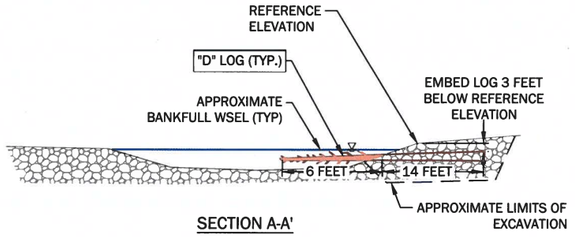
Walla Walla River Bridge-to-Bridge Design Drawings

Sheet **6.1**

Dwg name: \\geoengineers.com\wan\Projects\11\11281005\CAD\06\phase 3 design\11281005_Sht 12_6.1 [Typical Details - Flow Deflection Jam].dwg TAB:6.1 [Typical Details - Flow Deflection Jam] User: mwoods Plot time: Jan-06-23 @ 4:18pm



PLAN VIEW



SECTION A-A'

STRUCTURE QUANTITIES
LOG TYPE D - LARGE TREE TOP
18-25' LOG 10" TO 16" AVG. DIA.
2

PURPOSE:
- REDIRECTS FLOW.
- CREATES SCOUR.
- ENCOURAGES GRAVEL DEPOSITION.

DESIGN SPECIFICS:
- SWEEPERS MAY BE PLACED INDEPENDENTLY OR INCORPORATED INTO OTHER LARGE WOOD STRUCTURES.
- TREES WITH BRANCHES OR MULTIPLE TRUNKS PREFERRED.
- THE DESIGN ENGINEER SHALL MAINTAIN THE ABILITY TO MAKE ADJUSTMENT TO THE PROPOSED STRUCTURE IF SITE CONDITIONS WARRANT.
- SEE TABLE FOR MATERIAL SIZES AND QUANTITIES.
- SEE THIS SHEET FOR CONTROL POINT TABLE.

CONSTRUCTION SEQUENCING:
1. INSTALL WORK ISOLATION STRUCTURES AND DEWATER THE WORK AREA.
2. ESTABLISH REFERENCE ELEVATION PRIOR TO CONSTRUCTION AND CONFIRM WITH HYDRAULIC ENGINEER. REFERENCE GRADE HUB SHOULD BE ESTABLISHED OUTSIDE OF DISTURBANCE LIMITS AND USED TO CHECK STRUCTURE EMBEDDED DEPTHS. REFERENCE GRADE IS THE TOP OF THE BANK WHERE SWEEPER LOGS WILL BE INSTALLED.
3. PLACE TWO TYPE D LOGS A MINIMUM OF 3 FEET BELOW REFERENCE ELEVATIONS AND BURY 14 FEET OF THE TRUNK IN THE BANK. BRANCHES SMALLER THAN 3 INCHES ARE NOT COUNTED TOWARDS TRUNK LENGTH.
4. ORIENT SWEEPER LOGS SO THE BRANCHES EXTEND DOWN INTO THE CHANNEL, ABOVE THE THALWEG. BACKFILL THE STRUCTURE AND REBUILD THE BANK WITH NATIVE COBBLES AND GRAVEL. PLACE BACKFILL IN 1.0 FOOT LIFTS AND COMPACT WITH EXCAVATOR BUCKET OR SIMILAR METHOD BETWEEN LIFTS.
5. REMOVE DEWATERING AND FLOW ISOLATION STRUCTURE.

CONTROL POINT TABLE		
CONTROL POINT	NORTHING	EASTING
W1	267677.8	2128434.6
W2	267741.3	2128681.7
W3	267750.8	2128719.0
W4	267616.0	2129155.5

SWEEPER LOGS (9)
NTS ###

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1/10/2023

Revision No:	Date:	Description:	Initials:	Designed: BHM, RSC
				Drawn: SCY & KHR
				Checked: RSC, JRS
				Date: 01/06/2023
				Project No: 11281-005-06

Walla Walla River
near Lowden, Washington

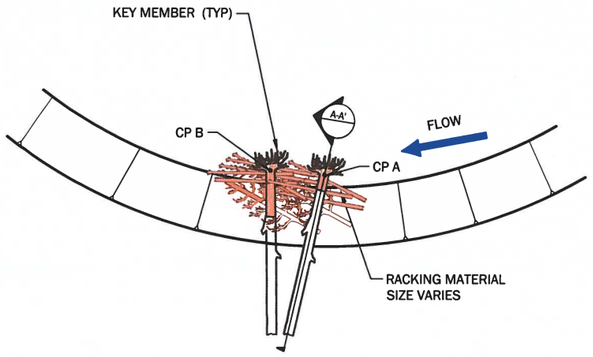
Tri-State Steelheaders

GeoEngineers
412 East Parkcenter Blvd., Suite 305
Boise, Idaho 83706

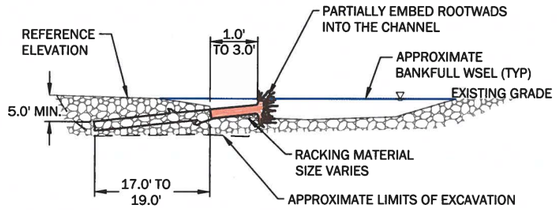
Typical Details - Sweeper Logs

Walla Walla River Bridge-to-Bridge
Design Drawings

Sheet
6.2



PLAN VIEW



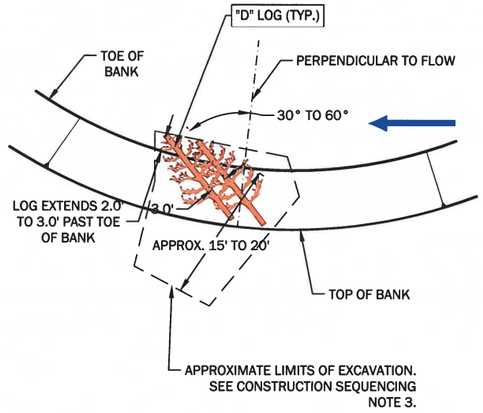
SECTION A-A'

STRUCTURE QUANTITIES				
LOG TYPE B - MEDIUM LOG WITH ROOTWAD	LOG TYPE D - LARGE TREE TOP	SMALL RACKING LOGS	SLASH MATERIAL (CY)	ROPE CONNECTIONS (EACH)
18-23' LONG LOG WITH ROOTWAD 12" TO 16" DBH	18-23' LOG 10" TO 16" AVG. DIA.	6' TO 15' 6" TO 8" AVG. DIA.		
2	2	6	2	2

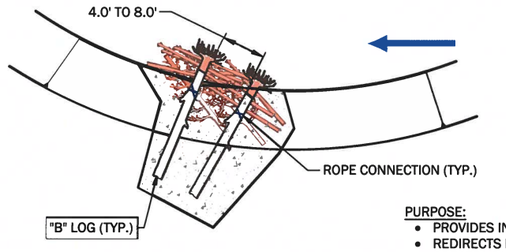
CONSTRUCTION SEQUENCING:

1. INSTALL WORK ISOLATION STRUCTURES AND DEWATER THE WORK AREA.
2. ESTABLISH REFERENCE ELEVATION PRIOR TO CONSTRUCTION AND CONFIRM WITH HYDRAULIC ENGINEER. REFERENCE GRADE HUB SHOULD BE ESTABLISHED OUTSIDE OF DISTURBANCE LIMITS AND USED TO CHECK STRUCTURE EMBEDDED DEPTHS. REFERENCE GRADE IS THE TOP OF THE BANK.
3. EXCAVATE A TRENCH TO PLACE TWO TYPE B LOGS AND TWO TYPE D LOGS. TRENCH SHALL BE DEEP ENOUGH TO ALLOW 5 FEET OF COVER ABOVE THE EMBEDDED ENDS OF THE TYPE B LOGS, MEASURED FROM REFERENCE ELEVATION. MINIMIZE DISTURBANCE TO BANK OUTSIDE OF TRENCH.
4. PLACE TWO TYPE D LOGS AT THE TOE OF THE BANK AT THE ELEVATION OF THE CHANNEL THALWEG OR AS DIRECTED BY THE HYDRAULIC ENGINEER. DISTANCE FROM REFERENCE ELEVATION MAY VARY BETWEEN STRUCTURE. ANGLE THE TYPE D LOGS DOWNSTREAM APPROXIMATELY 30°TO 60° AS SHOWN.
5. PLACE THE CUT END OF THE TYPE B LOGS IN THE TRENCH AND ROOTWADS INTO THE CHANNEL ON TOP OF THE TYPE D LOGS. ANGLE ROOTWADS INTO THE FLOW. ANGLE OF ORIENTATION MAY VARY BETWEEN PERPENDICULAR (0°) TO FLOW AND 30°. BASE OF THE ROOTWAD SHALL EXTEND BETWEEN 1 TO 3 FEET PAST THE TOE OF THE BANK. EMBEDDED END OF THE TYPE B LOG SHALL BE 5 FEET BELOW THE REFERENCE ELEVATION.
6. CONNECT EACH TYPE B LOGS TO A TYPE D LOG.
7. WEAVE SMALL RACKING LOGS AND SLASH BETWEEN LOGS.
8. BACKFILL THE STRUCTURE AND REBUILD THE BANK WITH NATIVE COBBLES AND GRAVEL. PLACE BACKFILL IN 1.0 FOOT LIFTS AND COMPACT WITH EXCAVATOR BUCKET OR SIMILAR METHOD BETWEEN LIFTS.
9. REMOVE DEWATERING AND FLOW ISOLATION STRUCTURE.

STEPS 1 - 4



STEPS 5 - 9



CONTROL POINT TABLE		
CONTROL POINT	NORTHING	EASTING
B1a	268094.7	2127566.2
B1b	268101.4	2127561.4
B2a	268116.1	2127743.7
B2b	268118.7	2127735.8
B3a	267814.2	2127962.8
B3b	267819.0	2127956.0
B4a	267846.6	2128143.4
B4b	267842.2	2128150.4
B5a	267756.8	2128421.3
B5b	267749.6	2128417.2
B6a	267685.9	2128537.6
B6b	267687.4	2128529.4
B7a	267452.9	2129145.6
B7b	267457.6	2129138.7
B8a	267257.1	2129497.8
B8b	267259.5	2129489.8
B9a	267212.6	2129489.5
B9b	267219.0	2129484.2

PURPOSE:

- PROVIDES INCREASED HYDRAULIC ROUGHNESS.
- REDIRECTS FLOW.
- CREATES DIVERSE FISH HABITAT.
- OVER TIME ACCUMULATES ADDITIONAL LARGE WOOD MATERIAL.

DESIGN SPECIFICS:

- THE DESIGN ENGINEER SHALL MAINTAIN THE ABILITY TO MAKE ADJUSTMENTS TO THE PROPOSED STRUCTURE IF SITE CONDITIONS WARRANT.
- SEE TABLE FOR MATERIAL SIZES AND QUANTITIES.
- SEE THIS SHEET FOR CONTROL POINT TABLE.

BANK ROOTWADS 10
NTS ###

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				Date: 01/06/2023
				Project No: 11281-005-06

Walla Walla River
near Lowden, Washington

Tri-State Steelheaders

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Boise, Idaho 83706

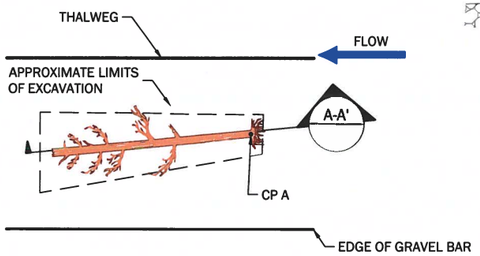
Typical Details - Bank Rootwads

Walla Walla River Bridge-to-Bridge
Design Drawings

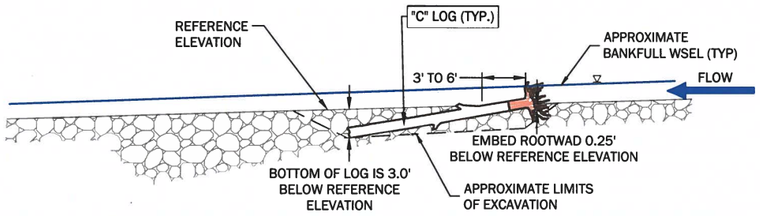
Sheet
6.3

Dwg name: \\geoengineers.com\wan\Projects\11\11281005\CAD\06\phase 3 design\1128100506_Sht 14_6.3 [Typical Details - Bank Rootwads].dwg TAB:6.3 [Typical Details - Bank Rootwads] User: nwoods Plot time: Jan-06-23 @ 4:18pm

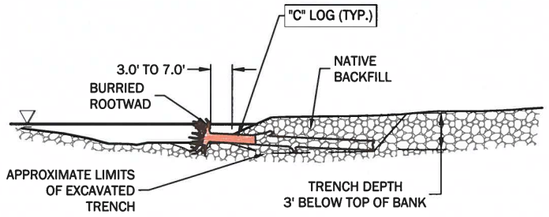
STRUCTURE QUANTITIES
TYPE C - SMALL LOG WITH ROOTWAD AND BRANCHES
18-23' LOG WITH ROOTWAD AND BRANCHES 8" TO 12" DBH
1



PLAN VIEW - GRAVEL BAR



SECTION A-A' - GRAVEL BAR



SECTION B-B' - MAIN CHANNEL

CONSTRUCTION SEQUENCING:

1. INSTALL WORK ISOLATION STRUCTURES AND DEWATER THE WORK AREA.
2. ESTABLISH REFERENCE ELEVATION PRIOR TO CONSTRUCTION AND CONFIRM WITH HYDRAULIC ENGINEER. REFERENCE GRADE HUB SHOULD BE ESTABLISHED OUTSIDE OF DISTURBANCE LIMITS AND USED TO CHECK STRUCTURE EMBEDDED DEPTHS. REFERENCE GRADE IS THE TOP OF THE BANK.
3. EXCAVATE A TRENCH TO PLACE ONE TYPE C LOG. LOG CAN EITHER BE A LOG WITH ROOTWAD OR WHOLE TREE WITH BRANCHES. BOTTOM OF TRENCH SHALL BE 3.0 FEET BELOW REFERENCE ELEVATION AT THE DOWNSTREAM WORK LIMITS.
4. PLACE TYPE C LOG IN TRENCH AS SHOWN IN SECTION VIEW.
5. BACKFILL THE STRUCTURE AND REBUILD THE BANK WITH NATIVE COBBLES AND GRAVEL. PLACE BACKFILL IN 1.0 FOOT LIFTS AND COMPACT WITH EXCAVATOR BUCKET OR SIMILAR METHOD BETWEEN LIFTS.
6. REMOVE DEWATERING AND FLOW ISOLATION STRUCTURE.

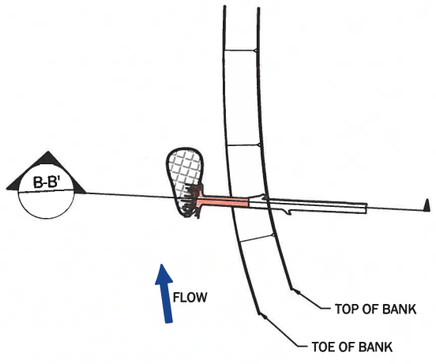
PURPOSE:

- SLOWS CHANNEL VELOCITY IN RIFFLES.
- CREATES DIVERSE FISH HABITAT.

DESIGN SPECIFICS:

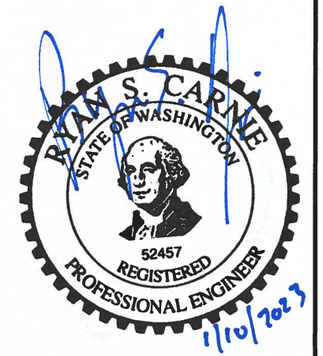
- THE DESIGN ENGINEER SHALL MAINTAIN THE ABILITY TO MAKE ADJUSTMENTS TO THE PROPOSED STRUCTURE IF SITE CONDITIONS WARRANT.
- SEE TABLE FOR MATERIAL SIZES AND QUANTITIES.
- SEE THIS SHEET FOR CONTROL POINT TABLE.

CONTROL POINT TABLE		
CONTROL POINT	NORTHING	EASTING
I1	267991.9	2127747.9
I2	267980.6	2127742.9
I3	267994.2	2127760.6
I4	267837.2	2127999.3
I5	267833.4	2128002.5
I6	267696.6	2128193.7
I7	267681.9	2128466.3
I8	267741.2	2128518.2
I9	267660.5	2128759.1
I10	267793.9	2128813.4
I11	267753.9	2128828.4
I12	267616.3	2128905.1
I13	267613.6	2128909.1
I14	267636.5	2129285.0



PLAN VIEW - MAIN CHANNEL

MAIN CHANNEL SINGLE LOGS 11
NTS ###



Revision No:	Date:	Description:	Initials:	Designed: BHM, RSC
				Drawn: SCY & KHR
				Checked: RSC, JRS
				Date: 01/06/2023
				Project No: 11281-005-06

Walla Walla River
near Lowden, Washington

Tri-State Steelheaders

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Typical Details – Main Channel Single Logs

Walla Walla River Bridge-to-Bridge Design Drawings

Sheet **6.4**

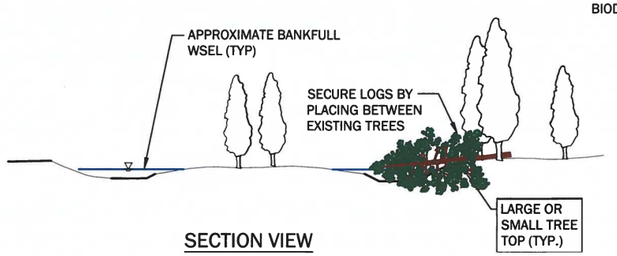
Dwg name: \\geoengineers.com\wan\Projects\11\11281005\CAD\06\phase 3 design\Xref\xr_Title.dwg TAB:Model User: mwoods Plot time: Jan-06-23 @ 4:15pm

FLOW DEFLECTION JAM CONTROL POINTS

CONTROL POINT TABLE		
CONTROL POINT	NORTHING	EASTING
F7c	267502.0	2129305.9
F8a	267408.9	2129517.7
F8b	267406.0	2129514.9
F8c	267412.0	2129512.3
F9a	267247.8	2129441.4
F9b	267250.8	2129444.0
F9c	267253.0	2129438.0
F10a	267269.5	2129478.3
F10b	267266.4	2129475.8
F10c	267272.0	2129472.7
F11a	267187.6	2129626.6
F11b	267184.5	2129624.0
F11c	267190.2	2129621.0
F12a	267222.3	2129674.1
F12b	267225.7	2129676.2
F12c	267226.8	2129669.9

TREETOP CONTROL POINTS

CONTROL POINT TABLE		
CONTROL POINT	NORTHING	EASTING
T1	268103.8	2127938.1
T2	267817.4	2128154.9
T3	267890.1	2128357.2
T4	267839.7	2128935.7
T5	267705.2	2129219.7
T6	267684.4	2129254.8



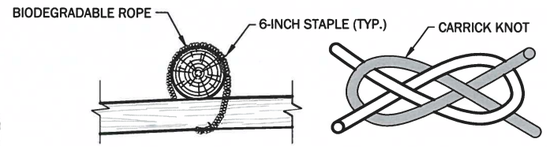
SECTION VIEW

STRUCTURE QUANTITIES (1 LOG PER STRUCTURE)	
LOG TYPE D - LARGE TREE TOP	LOG TYPE E - MED/SMALL TREE TOP
18-23' LONG LOG 10" TO 16" AVG. DIA.	18-23' LONG LOG 6" TO 10" AVG. DIA.
1	1

PURPOSE:
- CREATES CHANNEL AND FLOODPLAIN ROUGHNESS.
- CREATES DIVERSE FISH HABITAT.

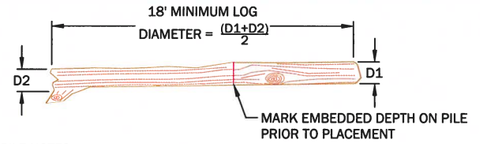
DESIGN SPECIFICS:
- SEE TABLE FOR MATERIAL SIZES AND QUANTITIES. LOG MAY BE EITHER LARGE OR SMALL TREE TOPS.
- TREE TOPS CONTAIN BRANCHES IN ADDITION TO ROOTWADS. HANDLE WITH CARE TO MINIMIZE BREAKING OF BRANCHES.
- PLACEMENT SHALL LOOSELY FOLLOW PLANS. EXACT PLACEMENT WILL BE FIELD FIT AND SHALL BE APPROVED BY THE CONTRACTING OFFICER.
- WEAVE LOGS BETWEEN TREES AS DIRECTED IN THE FIELD BY THE DESIGN ENGINEER.
- EXCAVATE ONLY AS NECESSARY TO SECURE TREE TOPS.
- MINIMIZE DISTURBANCE.
- THE DESIGN ENGINEER SHALL MAINTAIN THE ABILITY TO MAKE ADJUSTMENTS TO THE PROPOSED STRUCTURE IF SITE CONDITIONS WARRANT.
- SEE THIS SHEET FOR CONTROL POINT TABLE.

SIDE CHANNEL SINGLE LOGS 12
NTS 6.6



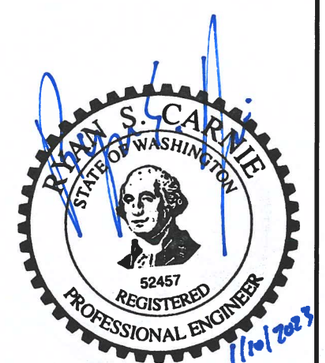
NOTES:
- ALL ROPE SHALL BE BIODEGRADABLE MANILA ROPE WITH A MINIMUM BREAKING STRENGTH GREATER THAN OR EQUAL TO 12,000 POUNDS.
- ROPE SHALL BE WRAPPED TWICE AROUND BOTH THE CONNECTING LOGS WITH A CARRICK KNOT. ALL EXCESS SLACK SHALL BE REMOVED FROM THE ROPE PRIOR TO TYING AND BINDING. NOTCH LOG TO PREVENT ROPE FROM SLIDING.
- SECURE BOTH FREE-ENDS OF ROPE WITH A 1/2-INCH X 6-INCH (MIN.) CABLE STAPLE, A MINIMUM OF 12 INCHES FROM THE END. STAPLES SHALL BE DRIVEN INTO THE LOGS TO PREVENT ROPE FROM SLIPPING. ALL CONNECTING HARDWARE SHALL BE NON-GALVANIZED.
- ROPE LENGTH VARIES PER CONNECTION.

ROPE CONNECTION 13
NTS ###



PILE NOTES:
- LOG DIAMETER IS THE AVERAGE OF THE DIAMETER MEASURED ON EITHER END OF THE LOG.
- LOG DIAMETER ON EITHER SIDE OF THE PILE MAY VARY BETWEEN 12 TO 18 INCHES.
- AVERAGE DIAMETER SHALL BE 15 INCHES.
- PILE LENGTH IS 18 FEET MINIMUM.
- PILE SHALL NOT EXTEND MORE THAN 2 FEET ABOVE THE TALLEST KEY MEMBER. BREAK OR CUT THE TOP OF THE PILE TO DESIRED HEIGHT FOLLOWING STRUCTURE INSTALLATION.
- PILES SHALL BE DRIVEN USING A VIBRATORY HEAD DRIVER. AN IMPACT HAMMER SHALL NOT BE USED.
- MARK MINIMUM EMBEDDED DEPTHS ON THE PILE PRIOR TO PLACEMENT.

PILES 14
NTS ###



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				Drawn: SCY & KHR
				Checked: RSC, JRS
				Date: 01/06/2023
				Project No: 11281-005-06

Walla Walla River
near Lowden, Washington

Tri-State Steelheaders

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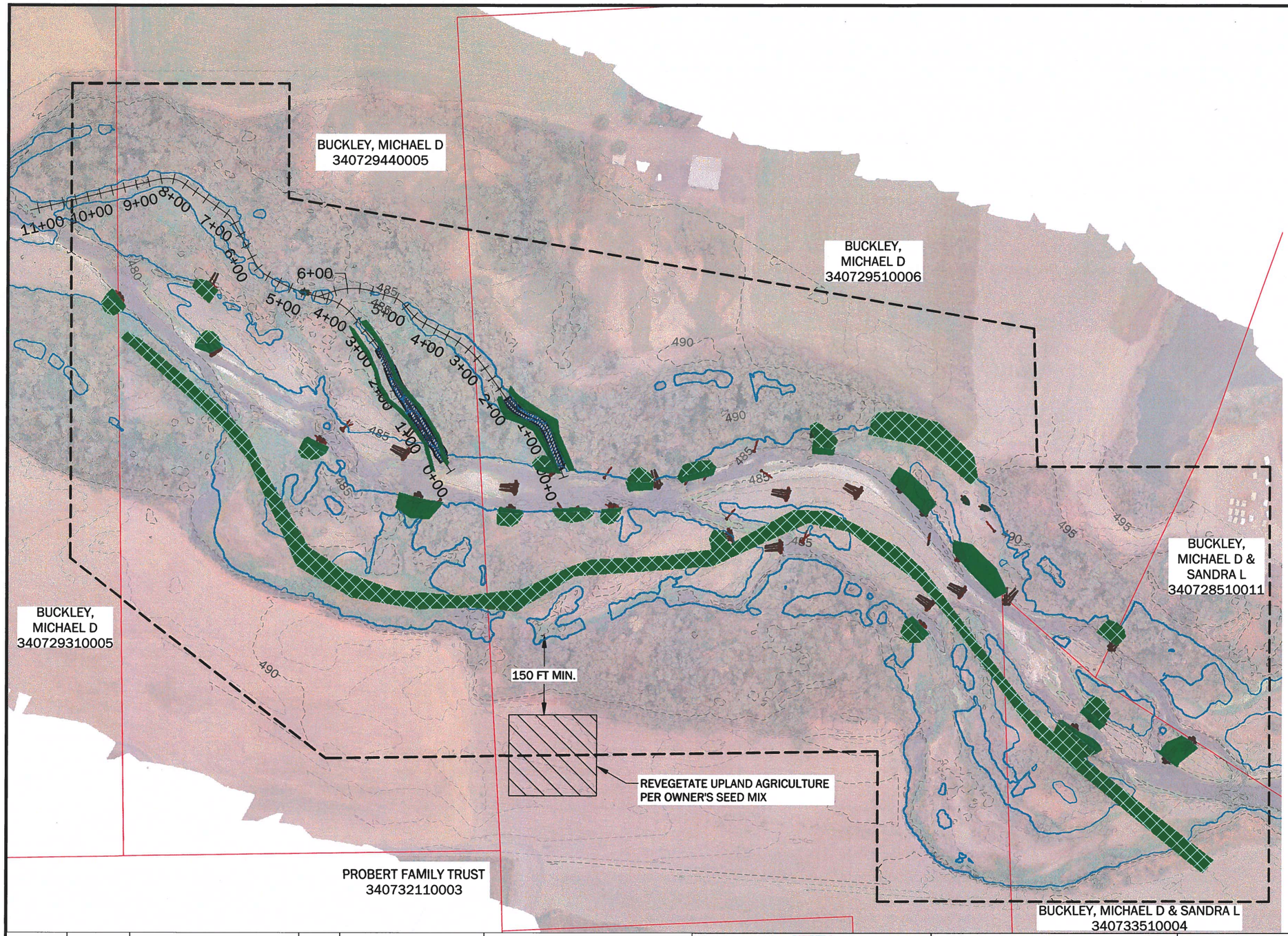
Typical Details – Control Points And Additional LWM Details

Walla Walla River Bridge-to-Bridge Design Drawings

Sheet **6.5**



LEGEND:

- BANK ZONE A (WET) APPROX. 5.1 ACRES
- RIPARIAN ZONE B (MOIST-WET) APPROX. 12.2 ACRES
- PHASE 3 BOUNDARY
- PARCEL PROPERTY BOUNDARY
- 1.5 YEAR INUNDATION BOUNDARY

N
W E
S

200 0 200
Feet

NOTES:

- ALL SHEETS ARE PROJECTED IN NAD 1983 WASHINGTON STATE PLANE SOUTH, INTERNATIONAL FEET, NAVD 1988.
- 1.5YR WSEL ELEVATION EQUALS 1,982 CFS
- AERIAL IMAGERY FROM RESOURCE SPECIALIST INC. SEPTEMBER 2022.

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STATE OF WASHINGTON
52457
REGISTERED
PROFESSIONAL ENGINEER
1/10/2023

Revision No:	Date:	Description:	Initials:

Designed: BHM, RSC
Drawn: SCY & KHR
Checked: RSC, JRS
Date: 01/06/2023
Project No: 11281-005-06

Walla Walla River
near Lowden, Washington

Tri-State Steelheaders

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Planting Plan

Walla Walla River Bridge-to-Bridge
Design Drawings

Sheet
7.0

Bank Zone A (Wet)			Area (AC)		0.8
Species	**Indicator Status**	**Size**	**Avg. Spacing (ft.)**	**Percent of Zone**	**EA**
Willow (Salix sp)	OBL/FACW	cutting	4	15%	246
Water birch (Betula occidentalis)	FACW	cutting	4	20%	327
Black cottonwood (Populus balsamifera)	FACW	cutting	15	10%	12
Redosier dogwood (Cornus sericea)	FACW	cutting	4	30%	491
Riparian Zone B (Moist - Wet)			Area (AC)		2.4
Species	**Indicator Status**	**Size**	**Avg. Spacing (ft.)**	**Percent of Zone**	**EA**
Willow (Salix sp)	OBL	cutting	6	15%	109
Black cottonwood (Populus balsamifera)	FACW	cutting/bare root	25	35%	15
Oregon ash (Fraxinus latifolia)	FACW	bare root	20	25%	17
Seed mix for Zone A/B (Includes an additional 5.0 acres for access roads, staging areas, temporary stockpiles, etc.)				Area (AC)	6.2
Species	**Indicator Status**	**Size**	**lbs/acre**	**Percent of Zone**	**Pounds**
Basin wildrye (Leymus cinereus)	FAC	Seed	10	100%	62
Sandberg's bluegrass (Poa secunda)	FACU	Seed	5	100%	31
Snake River wheatgrass (Elymus wawawaiensis)	FACU	Seed	10	100%	62
Beardless wildrye (Leymus triticoides)	FAC	Seed	10	100%	62
Meadow barley (Hordeum brachyantherum)	FACW	Seed	5	100%	31

NOTES:
- THIS TABLE IDENTIFIED THE PLANT SPECIES AND QUANTITIES FOR THE PROJECT NOTED.
- SEEDS ARE MEASURED BY POUND. POTTED PLANTS AND CUTTING MEASURED BY INDIVIDUAL PIECE.
- REFER TO SHEET 7.0 FOR PLANTING ZONE DESIGNATIONS AND LOCATIONS
- TRANSPLANTED MATERIALS AND LIVE CUTTING INTEGRAL WITH WOOD HABITAT STRUCTURES SHALL BE INSTALLED CONCURRENTLY WITH STRUCTURE PLACEMENT
- NATIVE VEGETATION ESTABLISHED THROUGHOUT THE RIPARIAN AREAS SHALL BE MAINTAINED TO THE BEST EXTENT POSSIBLE

RYAN S. CARNIE
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1/10/2023

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Walla Walla River
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Planting Notes

Walla Walla River Bridge-to-Bridge
Design Drawings

Sheet
7.1

APPENDIX B
Estimate of Anticipated Construction Costs

Phase 3 Construction Cost Workbook

Project: Bridge to Bridge Enhancement
Project Number: 11281-005-06

Analyst: RSC / BHM / KHR
Latest Revision: 12/27/22

Workbook Description

- This workbook contains spreadsheets that facilitate the analysis and/or design of this project.
- This spreadsheet lists the general project and workbook information that is consistent throughout the workbook.
- It also lists the titles of the spreadsheets contained in this workbook.
- This workbook is limited to the Construction Cost Estimate for modifications identified in the GeoEngineers Construction drawings and does **NOT** include the modifications proposed by others.
- This workbook is intended for use with ENGLISH UNITS.

Sheet Titles:

Phase 3 Construction Cost Workbook
Unit Costs
Phase 3 Bid Sheet
Phase 3 Summary

Unit Costs

Project: Bridge to Bridge Enhancement **Analyst:** RSC / BHM / KHR

Project Number: 11281-005-06 **Latest Revision:** 12/27/2022

- This spreadsheet calculates the costs associated with site preparation. Unit costs include materials, labor, equipment, overhead and contractor profit.
- Reference used for "unit costs" include:
  (1) R.S. Means Heavy Construction Cost Data Manual, 2022
  (2) Engineering Experience & Recent Similar Projects
  (3) Contractor or Supplier
- Inflation adjustment is negligible.
- Additional adjustments are based on engineering judgement, experience and site-specific degree of difficulty.
- Blank rows are provided at the bottom for additional items. Add new items & unit costs on this sheet, if necessary. These will be used to calculate costs on subsequent sheets.
- General mark-up percentages are also provided at the bottom.

Specification #	Item Description	Ref. ID	Ref. #	Units	Unit Cost ($)	Inflation & Location Adjustments (%)	Additional Adjustments (%)	Adjusted Unit Price ($)
2100	Environmental Controls - Best Management Practices	3		LS	20,000.0	0		20000.00
3110	Mobilization and Demobilization	2		LS	75,000.0	0		75000.00
3120	Construction Staking	2		Day	2,200.0	0		2200.00
3130	Temporary Channel Crossing	2		EA	5,000.0	0		5000.00
3210	Clearing, Grubbing, Stockpile and Disposal	2		LS	10,000.0	0		10000.00
3240, 3250	Temporary Stream Diversion, Dewatering	2		EA	5,000.0	0		5000.00
3310	Side Chanel Excavation	2		CY	30.0	0		30.00
3510	Install Apex Jam	2		EA	21,000.0	0		21000.00
3520	Install Flow Deflection jam	2		EA	17,000.0	0		17000.00
3530	Install Bank Rootwads	2		EA	6,000.0	0		6000.00
3540	Install Sweeper Logs	2		EA	4,000.0	0		4000.00
3550	Install Main Channel Single Logs	2		EA	2,000.0	0		2000.00
3560	Install Side Channel Single Logs	2		EA	1,500.0	0		1500.00
3710	Seeding	1	329219130020	AC	1,390.0	0		1390.00
3720	Planting	1	329343100140	EA	2.4	0		2.40
3710	Site Cleanup and Repair	2		LS	5,000.0	0		5000.00

Phase 3 Bid Sheet

Project: Bridge to Bridge Enhancement
Project Number: 11281-005-06

Analyst: RSC / BHM / KHR
Latest Revision: 12/27/2022

- This spreadsheet summarizes the construction quantities for all design componenents and alternatives considered.

Item #	Item Description	Units	Unit Cost	No. of Units	Total Cost ($)
2100	Environmental Controls - Best Management Practices	LS		1.0	
3110	Mobilization and Demobilization	LS		1.0	
3120	Construction Staking	Day		2.0	
3130	Temporary Channel Crossing	EA		2.0	
3210	Clearing, Grubbing, Stockpile and Disposal	LS		1.0	
3240, 3250	Temporary Stream Diversion, Dewatering	EA		9.0	
3310	Side Chanel Excavation	CY		435.0	
3510	Install Apex Jam	EA		10.0	
3520	Install Flow Deflection jam	EA		12.0	
3530	Install Bank Rootwads	EA		9.0	
3540	Install Sweeper Logs	EA		4.0	
3550	Install Main Channel Single Logs	EA		14.0	
3560	Install Side Channel Single Logs	EA		6.0	
3710	Seeding	AC		6.2	
3720	Planting	EA		1217.0	
3710	Site Cleanup and Repair	LS		1.0	
	Construction Sub-Total				

Phase 3 Summary

Project: Bridge to Bridge Enhancement
Project No: 11281-005-06

Analyst: RSC / BHM / KHR
Latest Revision: 12/27/2022

- This spreadsheet summarizes the costs for construction of the in channel habitat and stabilization measures.

Summary Table					
Specification #	**Item Description**	**Units**	**Unit Cost ($)**	**No. of Units**	**Total Cost ($)**
2100	Environmental Controls - Best Management Practices	LS	20000.00	1.0	$20,000
3110	Mobilization and Demobilization	LS	75000.00	1.0	$75,000
3120	Construction Staking	Day	2200.00	2.0	$4,400
3130	Temporary Channel Crossing	EA	5000.00	2.0	$10,000
3210	Clearing, Grubbing, Stockpile and Disposal	LS	10000.00	1.0	$10,000
3240, 3250	Temporary Stream Diversion, Dewatering	EA	5000.00	9.0	$45,000
3310	Side Chanel Excavation	CY	30.00	435.0	$13,050
3510	Install Apex Jam	EA	21000.00	10.0	$210,000
3520	Install Flow Deflection jam	EA	17000.00	12.0	$204,000
3530	Install Bank Rootwads	EA	6000.00	9.0	$54,000
3540	Install Sweeper Logs	EA	4000.00	4.0	$16,000
3550	Install Main Channel Single Logs	EA	2000.00	14.0	$28,000
3560	Install Side Channel Single Logs	EA	1500.00	6.0	$9,000
3710	Seeding	AC	1390.00	6.2	$8,618
3720	Planting	EA	2.40	1217.0	$2,921
3710	Site Cleanup and Repair	LS	5000.00	1.0	$5,000
SUBTOTAL CONSTRUCTION COST					$714,989
CONSTRUCTION OBSERVATION ESTIMATE					$35,000
TOTAL CONSTRUCTION COSTS					$749,989

GeoEngineers